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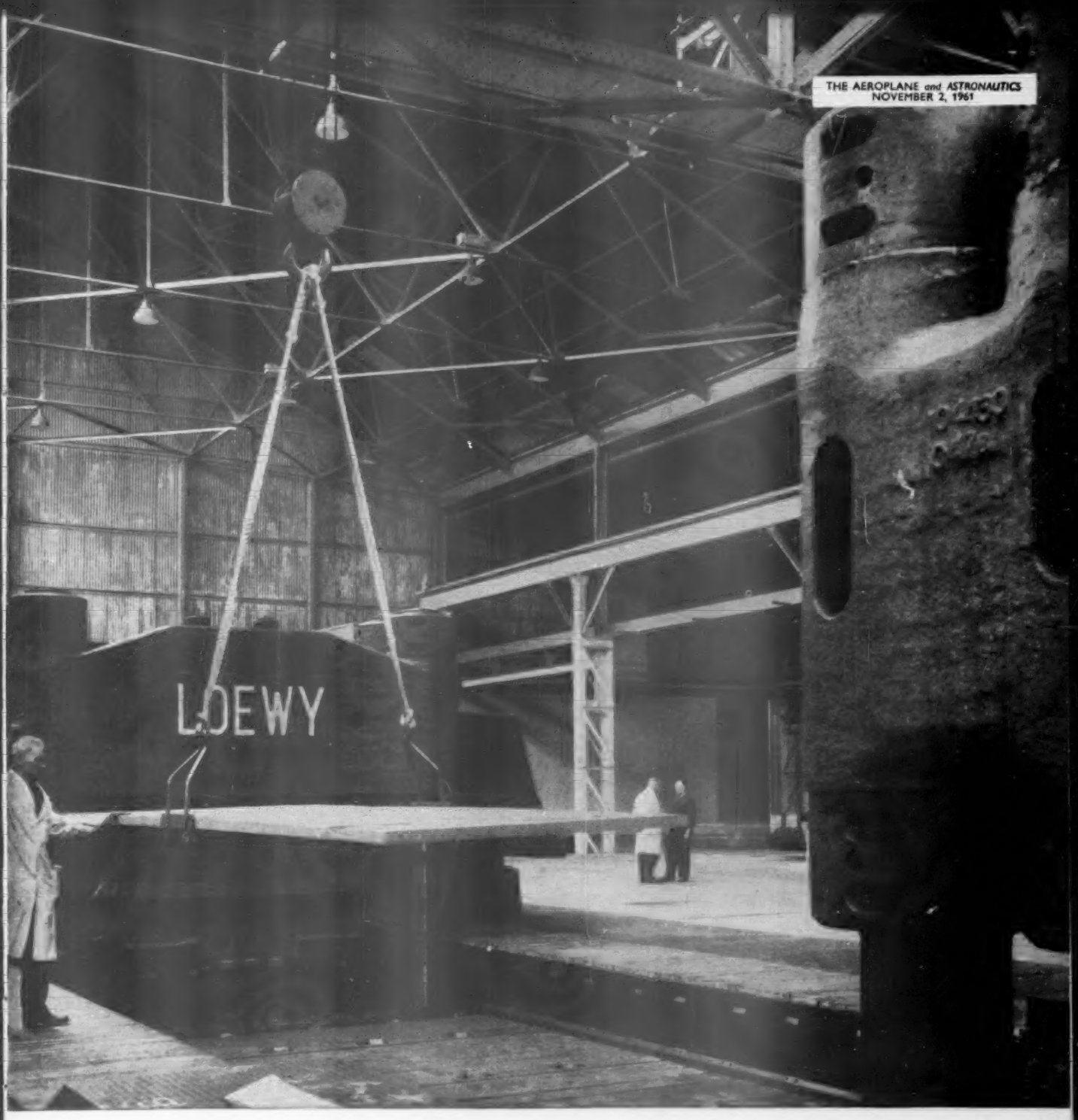

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2611 NOVEMBER 2, 1961

Keeping the Air Routes Open

It has long been acknowledged that the continued expansion of air transport systems throughout the World would ultimately bring with it some serious control problems. Just how serious these are—in the United States at least—have been sharply brought into focus at the recent meeting in Florida of America's Air Traffic Controllers Association. The problem of handling the growing volume of traffic around the country's busiest airports was said by one speaker to be a critical one. The control difficulties posed by the increasing number of aircraft that are "flying faster and faster towards a longer and longer waiting line before landing at the nation's larger airports," he said, "require an early solution, unless we are to see an undesired ceiling placed on the future of air transportation."

It is a salutary thought that the practical application of the civil aeronautical engineering technologies has reached a stage where it is likely to be stifled by its own rate of development. In fact, all the statistics point towards an approach to the saturation level in air traffic control; it has been estimated, for example, that by 1975 no fewer than 4,000 aircraft will be airborne over the U.S. every hour.

Maybe in the United Kingdom the figures will not attain quite so lofty a scale; but proportionally the difficulties are becoming no less serious and a great deal of effort is being directed towards providing the right sort of equipment to meet the case. Clearly in whatever system that is ultimately devised the bulk of the routine work will be done electronically, allowing the best possible use to be made of the incomparable operational flexibility of the human components that will oversee the system. This needs close analysis of the current situation and an accurate forecast of future developments. As remarked at the Florida meeting, the approach that is chosen must not be limited solely to today's problem; tomorrow's will follow all too quickly.

A Gap To Be Closed

Another aspect of civil aviation that has been in the news recently is that of safety—particularly in regard to the regulations and the independent operators. As recorded elsewhere in this issue, there has been a further exchange of questions and answers on this subject in the House of Commons. There has also been news of developments in the dissemination of flight safety information.

One of the most useful ways of reducing the incidence of accidents and near-accidents to a minimum is to make quickly available, for study by all concerned, the full details of any incident, serious or otherwise, that has occurred. It is in this field that the work of the airlines' own safety branches, the Flight Safety Committee, and other bodies, and the Flight Safety Foundation in America, play such a valuable part in aviation progress as a whole. Time, however, is the essence in these matters and in this respect, the most important of all the sources of accident information—the full-scale official accident reports—have an inevitable and somewhat long time-lag.

On many occasions the effectiveness of air safety control is called in question during the course of the investigations. The knowledge that interim action has been taken before the full report is made known would do much to alleviate public concern. The Ministry of Aviation should take the earliest opportunity to state categorically that in such instances steps are in fact always taken to tighten, or reinforce, the regulations without waiting until such a time as the report is published.

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Matters of Moment

September's Exports

AVIATION exports during September dropped to £9¼ million, the usual seasonal dip according to the S.B.A.C. Value of the industry's overseas sales for the first nine months of the year now stand at £118½ million of which £48 million is accounted for by dollar sales. The export total for the first three quarters of 1961 was some £10 million up on that for the same period in 1960 and represents an annual income of £158 million. When the August total of £14 million was announced this represented a rate of export income which corresponded to a possible total for the year in the region of £163¼ million.

The precise September total, £9,503,246, was made up as follows: aircraft and parts, £2,512,692; aero-engines and parts, £6,485,306; electrical appliances, £243,191; tyres, £64,597, and instruments, £197,460. Canada was yet again the leading buyer spending £186,803 on aircraft and parts and £1,456,651 on aero-engines and parts.

Space Group Cut-back

NEWS of a drastic reduction in the size of the Astronautics Section of Hawker Siddeley Aviation's Advanced Projects Group, and the departure of Dr. W. F. Hilton from the team, will come as a shock to the astronautical movement in this country. This move is part of a recent economy drive at Hawker Siddeley in which the original 16-man section has been reduced to three. The remaining members of the group will work under Mr. G. K. C. Pardoe.

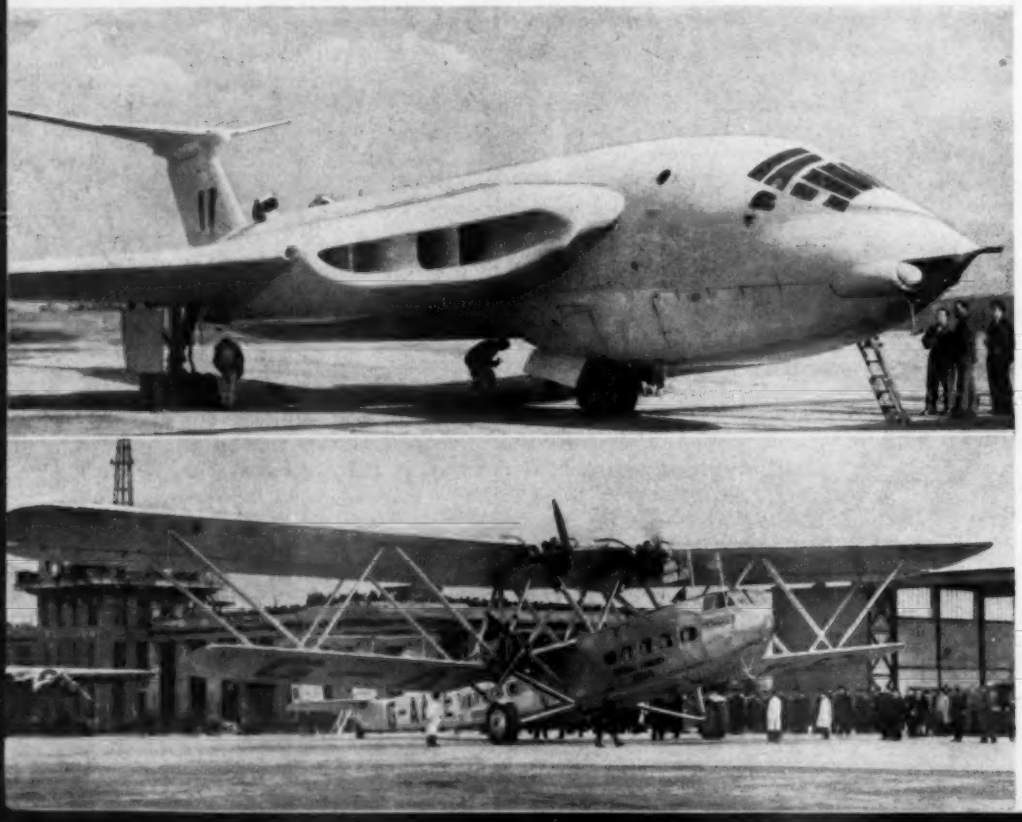
Dr. Hilton's team, as readers of this journal will be well aware, has been responsible for some promising ideas in the field of communications satellites, and their design studies have figured prominently in the joint Hawker Siddeley/SEREB report, "Industry and Space," from which has grown the concept of the industrial association of Eurospace.

At home, however, things have not been too happy. The slow progress which has been made in establishing the European Space Launcher Organization, and the restriction of work on communications satellites to the R.A.E., Farnborough, and the G.P.O. has meant that industry has not received the support which might have been expected. The absence, for so long, of an official space programme in which industry is properly represented, has meant that Hawker Siddeley have had to conduct their "space studies" purely as a private venture with little or no Government interest to sustain them. After 18 months, with no obvious prospects of a research contract, it is understandable that the company feels it must cut down this work to the absolute minimum.

MEN IN THE NEWS.—Following a fine speech recalling the early days, Lord Brabazon was presented with a steel statuette of himself at the Royal Aero Club's diamond jubilee dinner over which he presided last week. With him at the top table were Sir Frederick Handley Page and Mr. Peter Masefield.

The Astronautics Section was up to a few months ago part of the Advanced Projects Group of Hawker Siddeley Aviation at Richmond Road, Kingston. It was then decided to move the group to the London headquarters of the de Havilland Aircraft Company at Welkin House, so that they could work more closely with the Blue Streak team already installed there. This removed the Astronautics Section from the jurisdiction of Mr. S. D. Davies, technical director, Hawker Siddeley Aviation, and placed it under Mr. G. C. I. Gardiner, technical director (guided weapons), Hawker Siddeley Aviation. Mr. Gardiner was formerly technical director and chief executive, ballistic missiles, de Havilland Propellers, Ltd.

The depletion of the original H.S.A. Astronautics Section does not mean that the Group are any less interested in space development. De Havilland Aircraft are heavily concerned with the Blue Streak booster and for some time have had a group under Mr. Pardoe looking into the problems of space development generally. All the same, it is discouraging that the experienced team which Dr. Hilton has built up is to be so drastically cut down.—K.W.G.



TWO WINNERS.—As described by Sir Frederick himself at an R.Ae.S. Historical Group lecture on Monday, the Handley Page team has long specialized in building big aeroplanes. The H.P.42 of the '30s and the present-day Victor B.2 V-bomber are two of the company's long line of "winners."

EIREANN GATEWAY.—Cork's new airport (described in our previous issue) provides a convenient gateway to the tourist attractions of south-east Ireland. The control tower is seen here beyond an Aer Lingus Friendship.

Italian Views on Farnborough

ALTHOUGH it may seem to be late after the event, the current issues of many Italian aeronautical publications are devoted entirely to a review of Farnborough '61. In general the reportage is exhaustive in its scope, detailed and well documented with photographs. Of particular interest are the editorial views assessing the value of this year's show and commenting on the outlook for future S.B.A.C. Shows. The consensus of opinion is that this year's was of a very low standard and hardly justified the time and money spent on it by either organizers or visitors. However, much better prospects are foreseen for next year when it is generally forecast that a considerable number of new aircraft of advanced design will be displayed.

As to the future pattern of S.B.A.C. Shows, most Italian observers are convinced that the Society must inevitably decide to hold the show every second year, alternating with Paris. The entry of the U.K. into the Common Market, it is pointed out, will certainly result in a voluntary agreement to co-ordinate the incidence of aeronautical exhibitions in Europe.

In this connection, it is perhaps significant that no reference is made to Italy's announced intention to hold an international aeronautical Salon in Turin in 1962, and no claims are made regarding Italy's right to a share in this activity. This, in fact, is not very surprising for the news of Italy's intention to inaugurate its own aeronautical show was received in a very lukewarm manner by the Italian Press and some doubts were expressed as to the wisdom of the decision and the practical, commercial value of the event.—T.D.C.

Eurocontrol Navaid Evaluation

FOLLOWING its issue of a provisional operational specification for a navigational system for air traffic control in April of this year, Eurocontrol has decided to evaluate the Harco system proposed by the Decca Navigator Co., in collaboration with Compagnie générale de télégraphie Sans Fil (C.S.F.) of France and the Telefunken company of Germany.

A low-frequency hyperbolic area coverage aid based on Decca, the Harco system is a joint proposal by the three companies who have also secured the co-operation of the American Teleregister Corporation, which specializes in "on-line" data processing and systems design. Its evaluation, which is planned to be started early in the New Year, will require the modification of a Decca ground chain and will include a comprehensive flying programme.

Distributed to the electronic industries of the European countries concerned, the specification was produced by the Planning Directorate of Eurocontrol following its Technical Group's decision to explore the field of new or improved navaids to meet the needs of the area A.T.C. system which it envisaged. The salient features of this requirement include coverage extending from ground level to 80,000 ft.; an operational track keeping accuracy of ± 2 n. miles (95% probability) with a positional accuracy of the system of not less than ± 1.5 n. miles (95% probability); and pictorial presentation in the cockpit, to facilitate A.T.C. procedures in terminal areas, together with continuous position information for accurate reporting and to permit continuous track guidance.

Other features required cover integration with automatic techniques into the A.T.C. system by data links without loss of basic accuracy; compatibility with the long-range navigation systems; simplicity of interpretation and use of airborne equipment; and area coverage to permit any desired route structures and to facilitate changes without costly redeployment of ground stations.

Decca state that a deployment plan for Harco has been devised to give operational service over the whole route structure envisaged by Eurocontrol. The chain deployment has been designed to provide an accuracy of not worse than 0.25 n. miles by day and 1.5 n. miles by night. On the airborne side, computers and pictorial displays range from a relatively simple system for helicopters and light aircraft to an automatic undistorted, self-setting presentation such as that provided by the Mk. 3 Decca Flight Log and Omnitrac computer described on page 573 of this issue.

The developed air-ground component of Harco will automatically feed position, height and identity information into an A.T.C. computer. The scanning rate of such a data link would be of the order of 10 aircraft per second per channel, whilst the sequence of automatic interrogation of aircraft can be varied as required by control. The ground-air component of the dual link would feed back computed information to the aircraft such as required position and/or track to conform to the A.T.C. clearance.

Safety and the Independents

QUESTIONS regarding air safety regulations—particularly as touching independent operators—raised in the House of Commons on Oct. 18 (see our Oct. 26 issue) were pursued from both sides of the House last week. SIR DONALD KABERRY (Cons., Leeds, N.W.) asked the Minister of Aviation how often regulations concerning charter air flights from the United Kingdom were revised; what was the date of the last revision; and invited a statement. MR. J. W. SNOW (Lab., Lichfield and Tamworth) asked the Minister whether he was aware of the need for a speedy reconciliation of the rights of charter companies and the need to protect the public against contravention or inadequate safety control by such charter companies. He also asked whether, in view of the delay in dealing with cases involving air transport safety and the publication of findings by his Inspectorate, he would institute a Departmental inquiry to examine the American method, operated by the Federal Aviation Agency, whereby findings are published more speedily and action taken against delinquent air transport companies.

Again in written answers MR. THORNEYCROFT made the point that safety regulations for public transport applied to private enterprises and to the Corporations alike. He went on to say that regulations generally were revised and consolidated as recently as August, 1960, and that since then there had been a major amendment to safety control of operators by the introduction, with effect from March this year, of a system of Air Operators' Certificates. Under this system all operators of public transport aircraft of more than 5,000 lb. weight were required to obtain from the Ministry a certificate that they were competent to operate a safe public service. Standards of this certificate were enforced by inspectors both of the Ministry and of the Air Registration Board as regards training, maintenance and general operating practice. The new system, he said, had already shown beneficial results and was calculated to assist operators in securing a progressive raising of safety standards.

Accident investigation, including methods followed abroad, the Minister stated, had recently been most thoroughly reviewed by an independent Committee under the chairmanship of

Matters of Moment . . . .

Mr. Justice Cairns. The Committee's report, published on Mar. 1 last, did not suggest that adoption of different methods in this country would result in speedier findings.

To wind up the issue MR. R. MASON (Lab., Barnsley) asked the Minister to list the number of private air companies now operating in this country, the number of aircraft each operated, and the mileage per accident flown jointly in the past 12 months and five years respectively. Mr. Thorneycroft replied that there were 65 private air companies in this country owning a total of 508 aircraft. Of these, 55 were engaged in public transport with 463 aircraft, 32 of whom operated in all 269 aircraft over 5,000 lb. weight, for which they needed operators' certificates. (These 269 aircraft were listed by types in a table published in *Hansard*, from which it was interesting to see that almost one fifth of the total—namely 53—were evergreen Dakotas. The perennial Rapide accounted for 13.)

During the 12 months ended Mar. 31, 1961, approximately 50 million aircraft miles were flown by independent operators on public transport services per fatal aircraft accident. The comparable figure for the five years preceding that date was of the order of 17 million aircraft miles.

Preparing for E.S.L.O.

A CONFERENCE to complete arrangements for a European Space Launcher Organization, based on the Anglo-French proposals to develop Blue Streak and a French rocket as the basis of a European heavy satellite launcher, opened at Lancaster House on Oct. 30. Attending were representatives from Austria, Belgium, Denmark, West Germany, the Netherlands, Italy and Spain, besides the United Kingdom and France. Observers had been invited from Norway, Sweden and Switzerland.

Opening the Conference, Mr. Peter Thorneycroft, the Minister of Aviation, said that the proposals before the meeting could be simply and succinctly stated. First, it was necessary to discuss the convention for the organization to complete a three-stage launcher, capable of putting commercially useful payloads into orbit, as soon as possible. Secondly, while this was going on, and parallel with it, it was necessary to arrange for future work so that later all organizations would be ready with new advanced projects.

The object was for all to share in this work now and in the future, both for its benefits in space and the technological benefits in other fields. Our purpose throughout is the peaceful exploitation of these devices as commercial and other opportunities unfold.

Immediate tasks were to agree on the convention which would be the basis of the organization that is set up; to establish a planning group to get on with the organization's initial programme, whatever that is decided to be; and, finally, to lay down a broad outline of future work and study.

The Herald for Army Use?

VISITORS to the recent Army Display (Argus) on Salisbury Plain have reported that the Handley Page Herald which gave a demonstration was introduced by the commentator as "the new light transport for the Army." We have not been able to confirm that any official decision in the matter has yet been reached.

Anglo-American VTOL

ANOTHER contender for the NATO VTOL fighter contract was disclosed earlier this week in a statement from Belfast that Short Bros. and Harland have been collaborating with Lockheed in the projection of a version of the F-104 Starfighter with VTOL capabilities. This, it has been said, will incorporate tip-mounted vertical take-off engines. No positive statement has been made regarding the powerplants that will be used.

It would seem, however, that with Short's extensive experience in relation to the type of VTOL aircraft that has separate lift and propulsion powerplants, this is likely to be the final choice for the new project. From this one would expect that some later version of the Rolls-Royce RB.108 would be used to give the necessary vertical thrust. Indeed, the use of a dual-purpose engine such as the Pegasus would presuppose replacement of the Starfighter's normal powerplant; and it is difficult to see what would then be gained from mounting such engines at the wing-tips as suggested in the official statement.

One recalls that some years ago Shorts did, in fact, design, for their PD16 light freighter project, a wing-tip lift-engine pod of the type presumably envisaged for the VTOL Starfighter.

So far, this Short/Lockheed proposal has reached no further than preliminary investigation and discussion. It is, however, quite certain that should the Short team come into the BMR-3 picture as a result, their propect will have behind it a great deal of pracical VTOL experience.

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SELF-DRIVE ROTORCRAFT.—As recently reported, Rent-a-Copters, Ltd.—a company set up by Helicopter Sales—has inaugurated a helicopter self-drive service. Using Hiller three-seaters the basic hire rates are £45 per day, £225 per week, £970 per month plus £8 per flying hour.

Engineering Consultant

AIR VICE-MARSHAL G. SILYN ROBERTS, C.B., C.B.E., A.F.C., M.C., F.R.Ae.S., will have completed over 30 years' service with the Royal Air Force when he retires shortly, before the end of November. Air Vice-Marshal Silyn Roberts, who became Director-General of Engineering at the Air Ministry three years ago, is setting up as a consultant. We understand that he has been retained in this capacity by Electro-Hydraulics, Ltd., of Warrington, who are internationally known as designers and manufacturers of undercarriages and hydraulic mechanisms.

The Air Vice-Marshal has spent most of his Service career on engineering problems. After experimental flying duties at the R.A.E., Farnborough, to do with pilotless aircraft, followed by service overseas, he became Chief Technical Officer E.C.F.S. in 1942, and a year later joined M.A.P. as Deputy Director of Technical Development. Two years later he became Director of Aircraft Research and Development.

He went back to Farnborough as C.O. of the Experimental Flying Department from 1947 until 1948. His next move was as Senior Technical Staff Officer to No. 2 Group and then back to the Ministry of Supply as Deputy Director of Military Aircraft (Research and Development). He was Senior Technical Staff Officer Bomber Command from 1956 to 1958.

When in London Air Vice-Marshal Silyn Roberts will, for the present, be conducting his business from 104 Regent's Park Road, London, N.W.1.

Retiring from Shell-Mex and B.P., Ltd.

A WIDELY representative gathering of aviation people went to Shell-Mex House on Oct. 30 to say goodbye to Cecil Field who, as Aviation Manager of Shell-Mex and B.P., Ltd., is retiring just about 30 years after his appointment to the job on the formation of the department. Those present represented the civil and military sides of aviation in this country and now at the peak of their careers could exchange reminiscences with their host that covered over 40 years in the flying business.

Cecil Rhodes Field joined the R.F.C. in 1916 at the age of 19 after being educated at Christs Hospital. His service with the R.A.F. included duty with the North Russian Expeditionary Force in 1919. He joined Shell-Mex in the early nineteen-twenties and in those days the chap on the job (and his first job was in Birmingham) was expected to live on it; he recalls ruefully that the hotel in which he found digs was not regarded as meeting this spartan specification.

He became a member of No. 605 (County of Warwick) B Squadron A.A.F. in 1927 and at a recent luncheon tried to persuade his hearers that his progress could be traced to the good use he made of certain tickets to the Lord Mayor's Show.

Combined with these early links with the R.A.F. and the Auxiliary Air Force, Mr. Field made a tremendous circle of friends in civil aviation. For 30 years it is true to say that he has been seen at practically every aviation gathering of importance in this country.

Fortunately, this unique experience of aviation affairs is not to be lost for Mr. Field will continue to sit on the Private Flying Loan Fund Committee which continues the good work of the Kemsley Flying Trust.

Aviation News in General

NEW DESIGNATIONS.—GA.11 is the designation allotted to a number of Hunter F.4s which are to be modified for use by the Royal Navy for ground attack training. Deliveries will begin next year. The Navy's Wasp anti-submarine helicopters have received the designation HAS.1; the R.A.F.'s five Comet 4Cs are to be known as C.Mk.4s. Mention has also been made of the Sea Vixen FAW.2.

VTOL PROJECT NAMED.—The designation D.24 and name Alliance have been given to the Fokker/Republic entry for NATO's V/STOL tactical strike/reconnaissance fighter design competition. A project model is now undergoing second phase wind-tunnel testing at the Netherlands National Aeronautical Laboratory. Mr. Alexander Wadkowsky of Republic has been named programme manager for the aircraft.

YUKON SIMULATOR.—A Redifon CL-44 flight simulator, for installation at R.C.A.F. Trenton, Ont., has been flown out from Gatwick in two C-130 Hercules transports.

GERMAN STRIKER.—A combine of Messerschmitt, Heinkel and Bölkow are working on a fighter-bomber with Mach 2 capabilities according to reports from Germany. Known as the VJ101 it will be powered by an engine developed in conjunction with Rolls-Royce, the reports say.

HOVERING TANKER.—A Sikorsky HUS-1 tanker helicopter has successfully refuelled another machine in flight during recent U.S. Marine Corps exercises. It also refuelled an infantry tank.

ATLANTIC FLIES.—The Breguet Atlantic made a 42-min. first flight on Oct. 21. Bernard Witt was at the controls. A second flight of 2 hr. 10 min. was on Oct. 24. Representatives of governments associated with the Atlantic programme are to see the aircraft at Toulouse on Nov. 3.

ROYAL FLIGHT.—Princess Alexandra of Kent left the U.K. on Oct. 29 by B.O.A.C. Britannia at the start of a round-the-World flight. She was to fly by way of Montreal, Vancouver, Honolulu and Wake Island to Hong Kong and will also visit Bangkok, Rangoon, Gan, Aden, and Tripoli before her return to London on Dec. 11.

FIGHTER CO-OPERATION.—Republic and Chance Vought are to submit a joint design for the U.S. Defense Department's TFX fighter design competition (see pp. 443-444 of our Oct. 5 issue).

KATANGAN EXPANSION.—Founded on the original Belgian Force Publique, the Katangan Air Force is being expanded by the arrival of five Dornier Do 28 STOL light twins, which are the first of nearly 50 aircraft on order. Other types reported on order for the K.A.F. include Alouette and Sikorsky helicopters, Harvards, nine Fouga Magisters, five Sabres and some DC-4s.

L.A.P. CONCESSION.—Arrangements for the use of London (Heathrow) Airport by non-scheduled commercial and executive and private aircraft (see our issue June 29, 1961) are to be continued until further notice.

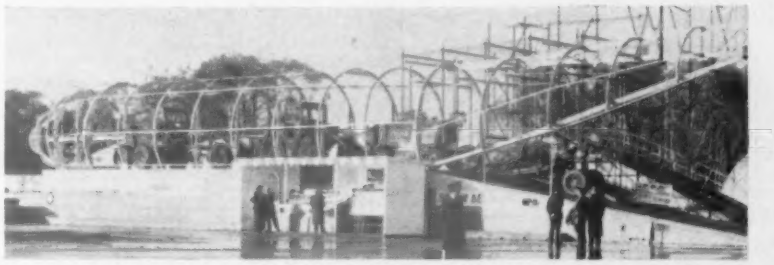
CONVERTIPLANE RECORDS.—The 366 km.p.h. (227 m.p.h.) credited to the Kamov Vintokryl in our issue for Oct. 19 was over a 15-25 km. straight line and not a 100-km. circuit. The attempt over the latter distance was on Oct. 12 when an average of 336 km.p.h. (209 m.p.h.) was achieved. During this flight speeds of 375 km.p.h. (233 m.p.h.) were reached. Both records are to be submitted for F.A.I. recognition.

VIGILANT WARHEAD.—Weight of the warhead of the Vickers Vigilant anti-tank missile (depicted in the World Missile Digest in our Oct. 12 issue) is 10¾ lb. of which 6½ lb. is actual explosive filling. This gives a warhead/A.U.W. ratio of 36% of the flying weight, claimed as the highest for any comparable anti-tank guided weapon.

SATURN SUCCESS.—The prototype Saturn C-1 was successfully launched from Cape Canaveral on Oct. 27. Fitted with water-ballasted top stages, the eight clustered engines developed a thrust of 1.3 m. lb. in 1.4 sec. The vehicle rose to a height of 95 miles, plunging into the Atlantic about six miles from its intended impact point 225 miles downrange.

SEVEN UP.—Two more multi-stage rockets were fired from the Soviet Union a distance of some 7,500 miles into the central Pacific on Oct. 22 and 28. These—the sixth and seventh firings—complete the present test series. According to *Tass*, both struck the predetermined point of impact with high accuracy.

NO HAYSTACK!—U.S.A.F. radar was reported on Oct. 26 still to be looking for the 350 million tiny copper "needles" which Midas IV is supposed to have distributed 2,000 miles above the Earth. The Air Force said it had not yet been determined whether the dipoles had been ejected from their package.



SKELETON FREIGHTER.—This full-scale "mock-up" of the Short Belfast has been on show at the Army's Fighting Vehicles Research and Development Establishment at Chobham this week. Four earth-moving vehicles are in the fuselage.

Commercial Aviation Affairs

AVRO DELIVERY.—The first Avro 748 of three ordered by Skyways was to be formally accepted at Lympne today, November 2. It is to be used for crew training and route proving until next spring.

FRENCH BUDGET.—Provision is made in the 1962 appropriation of the French Department of Public Works and Transport for expenditure of NF 102 million on modernization of French airways and navaids, and airport development. A loan of NF 106 million will be made to Air France to finance four Boeing 707-320B and seven Caravelle. A sum of NF 100 million is allocated for Caravelle development and NF 12 million to finance the putting into production of the Super Broussard.

LUTON HANDLING.—Lutair Handling Services, Ltd., has been appointed by K.L.M. as its passenger and freight handling agent at Luton, which is now the airline's No. 1 alternate for London (see page 567). The first K.L.M. diversion to Luton was a Viscount on Oct. 30. Lutair is already the agent at Luton for Autair, Derby Airways, Trans Mediterranean Airways, Nordair (of Denmark) and others.

AUSTRALIAN CHOICE.—Ansett-A.N.A. has narrowed its choice of initial jet equipment to the de Havilland Trident or Boeing 727 according to Mr. J. North, the airline's commercial manager. Final decision is not expected to be made until next year.

ORDERS CONFIRMED.—Boeing Transport Division has confirmed two orders for 707 transports already announced by the airlines concerned. They are from Air France for four 707-320Bs and from Air India for two more 707-420s. The latter are for delivery in March and April next year.

FRIENDSHIP OPTION.—Bonanza Air Lines has confirmed the placing of an option with Fairchild Stratos Corporation for an F-27. Bonanza at present has a fleet of nine F-27s in service.

AUSTRALIAN LEGISLATION.—The Airlines Agreement Bill passed by the Australian Parliament on Oct. 26 extends for a further ten years the existing arrangement under which the Government guarantees loans to Ansett-A.N.A. for the purchase of new aircraft. The new bill also provides for the Minister to set an annual profit target for T.A.A.

NORTH-SOUTH CHANGES.—The Yeadon operator, North-South Airlines, is under new management. Mr. Ronald W. McBean, head of McBean Tours of Leeds, is in charge of the take-over. The new board will be announced in due course; the general manager is Mr. R. W. Lea. North-South has one DC-3.

JAMAICAN AIRLINE.—Jamaica plans to start its own national airline, according to the Prime Minister, Mr. Norman Manley, in a recent speech. As forecast in our issue for Oct. 12, p. 476, this is the inevitable sequel to the purchase of B.W.I.A. by the Trinidad Government.

INTERNATIONAL AIR AFRIQUE.—Regular international flights by Air Afrique on the routes Douala-Cotonou-Abidjan-Dakar-Port Etienne-Paris and Port Gentil-Libreville-Douala-Nice-Paris began last week. A Super Constellation has been obtained for the former route and a DC-6 for the latter. Air Afrique uses a fleet of DC-4s for regional operations in Africa serving the 11 ex-French states which have a share in the company.

MADAIR BEGINS.—The national airline of Madagascar began operations under the name Madair on Oct. 20 on the route Tananarive-Paris, using a DC-7 leased from T.A.I. for a weekly service. Formed by Air France and Air Madagascar with a 20% Government interest, Madair will take over domestic routes in the island on Jan. 1, 1962.

JET ANNIVERSARY.—In its first three years of jet operations, Pan American World Airways has carried nearly 2 million passengers on jet aircraft. The 52-aircraft fleet has completed 240,043 hours, and the Boeing 707 which operated the first service on Oct. 26, 1953, has flown nearly 8,000 hrs.

JULY AIRPORT ACTIVITY.—Air transport movements during July at U.K. and Channel Islands aerodromes totalled 59,661—an increase of 9% by comparison with July, 1960. Passenger numbers increased by 15% and freight by 7%. Biggest passenger increases were for Portsmouth (by 277% to 4,535) and Bournemouth, Hurn (by 144% to 38,125).

AIRLINE UNION BID.—Organization of the U.S. airline industry will be attempted by the International Brotherhood of Teamsters, who have set up a National Airlines Division. Director of the Division is H. J. Breen, formerly secretary-treasurer of the Flight Engineers International Association.

CAMBRIAN GROWTH.—In the first nine months of this year, Cambrian Airways carried just over 70,000 passengers—an increase of 34.3% over the same nine months of 1960. Particularly large increases were recorded on the routes serving Bournemouth/Southampton, Paris and Dinard.

SIERRA LEONE LINK.—A weekly London-Freetown-Lagos service is to be introduced by Sierra Leone Airways later this month, using a Britannia and crew chartered from B.U.A. The latter company undertook to operate Sierra Leone Airways earlier this year and has provided a Twin Pioneer for local services to be followed soon by a Heron.

MORE FLIGHT RECORDERS.—The F.A.A. is proposing a regulation which will require flight recorders on all aircraft of more than 12,500 lb. gross weight which are either turbine powered or operate above 25,000 ft. This rule would apply to business and executive aircraft as all airline aircraft are already required to carry recorders.

APPLICATIONS WITHDRAWN.—British United Airways has withdrawn its applications for Class A licences to Africa and the Far East.

LUTON NAMED.—As recorded on p. 567 Luton Airport is to be used by K.L.M. The Mayor of Luton, Ald. G. H. Matthews (standing) announced this at a recent Press conference. Also present were (l. to r.), Mr. H. T. Rushton (airport manager), Cllr. J. MacDonald, (airport committee chairman) and Mr. L. Koops (U.K. and Eire station manager for K.L.M.)

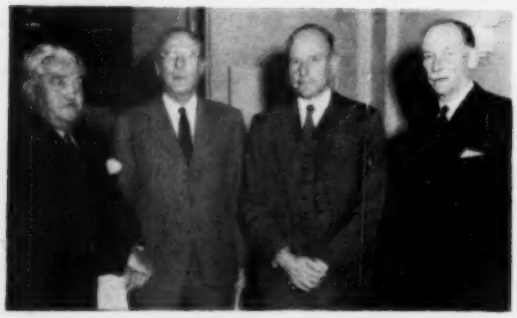
Photograph copyright "The Aeroplane and Astronautics"

News About People

MINISTRY APPOINTMENTS.—Three new appointments to key positions within the M.o.A. announced last week were those of Mr. J. E. Serby as Deputy Controller of Guided Weapons, Mr. R. E. Sainsbury as Director-General of Guided Weapons and Electronics Production and Mr. R. V. Whelpton as Director of the Signals Research and Development Establishment, Christchurch.

RECOGNIZING ACHIEVEMENT.—The Institute of Navigation's Gold Medal for 1961 has gone to Mr. Francis Chichester, navigation specialist, map maker and author. The citation speaks of "outstanding feats of single-handed navigation at sea and in the air." Best remembered of these are his winning of last year's Atlantic single-handed yacht race, the second complete solo England-Australia flight in 1929, first East-West solo crossing of the Tasman Sea in 1931 (in a Gipsy Moth seaplane) and the first solo seaplane Australia-Japan flight, also in 1931.

CHANGES IN FRANCE.—M. Paul Mazer has handed over as president and general manager of Nord Aviation to M. Jean Cahen-Salvador in order to become president of Max Holste. He continues as honorary president of Nord. At Max Holste M. Mazer has M. Pierre Clostermann as his assistant manager.



COSSOR BOARD.—Dr. C. L. Calosi and Mr. C. F. Adams, (centre), vice-president and chairman respectively of the Raytheon Co., are now members of the A.C. Cossor, Ltd., board following this company's purchase by Raytheon. Left is Mr. J. S. Clark, Cossor managing director and right, Sir Miles Graham, Cossor chairman.

NEW TO BEAGLE.—Sir Mark A. Norman, Bt., is to become commercial director of the Beagle Group and a director of both Beagle-Auster Aircraft and Beagle-Miles Aircraft, on Nov. 20; he has been executive assistant to the managing director of Bristol Siddeley Engines since 1959. Also joining Beagle is Mr. E. M. Bellamy who is appointed technical assistant to Mr. J. W. P. Angell, group production manager.

SHORTS MANAGER.—Capt. I. F. M. Newnham, R.N. (retd.), has joined Short Brothers and Harland as manager of its precision engineering division at Castlereagh, Belfast. This division is mainly concerned with guided weapon design and development.

WEYBRIDGE PROMOTIONS.—Mr. H. Zeffert and Mr. M. H. Still have been appointed chief systems engineer/E and deputy chief systems engineer/E respectively of Vickers-Armstrongs (Aircraft).

SMITHS SALES.—Until recently technical secretary of BALPA, Mr. L. F. E. Coombs has joined the technical sales department of Smiths Aviation Division. He will be concerned with marketing of the company's range of engine instruments and equipment.

Air Transport

Focus on Safety

THE Flight Safety Committee—which was formed in 1959 and was previously known as the Transport Flight Safety Committee—has now entered a new era.

It has financial backing from essentially interested airlines, groups and authorities; it has a positive geographical location—Building 208, Epsom Square, London (Heathrow) Airport, Hounslow, Middx; it has an independent, full-time working secretariat led by Mr. A. H. Wallace of the Ministry of Aviation; and incident/accident information will now be disseminated approximately every six weeks in *Flight Safety Focus*—which is an improved, developed and indexed version of earlier bulletins.

The Committee consists of representatives from B.O.A.C., B.E.A., BIATA, the Air Ministry (Directorate of Flight Safety), the Ministry of Aviation (Aviation Safety and General Group), the insurers (two members), aircraft commanders (two, recommended by, but not necessarily representing, GAPAN and BALPA), the Air Registration Board and the S.B.A.C.

The present chairman is Mr. J. W. Gibbs, M.B.E., of B.E.A.'s Air Safety Branch, and the two aircraft commanders are Capts. J. T. Percy and D. F. O'Sullivan. In addition, there is a discussion group which will have an appropriately flexible membership.

The primary objects of the Committee are "to collect and disseminate flight safety information and to foster interest in, and to work for, the advancement of flight safety in all sections of aviation." The immediate policy will be to encourage the sharing of experience and to develop sources of information; to give as much useful information as possible in *Focus*; to establish links with the industry; and to co-operate with similar organizations throughout the World. Later, the secretariat may have the time and the opportunity to develop statistical and other associated work—but, at present, the object is to collect and select information and to keep everybody informed of all events, incidents and accidents from which useful lessons can be learnt.

There is nothing specifically new, of course, about such promulgation of safety information. The Flight Safety Foundation, for instance, has been doing it for many years and the general form of *Focus* is to some extent based on the S.F.S. bulletins. B.E.A.'s air safety committee issues a monthly confidential review in which details of all "reportable" accidents are given and in which later findings are reported in supplementary material. The A.R.B. also offers, in its confidential newsletter, *Above Board*, some similarly useful material as seen from the Board's own viewpoint.

If it is to be of maximum value, a bulletin of incident/accident reports must be hard to the point of brutality. The contents of this first issue in the new version of *Focus* are too anonymous and unrelated to make an effective impact. *Focus* is, after all, a confidential document and its readers must therefore be selected—and be sufficiently trusted to accept the full facts of airline-incident life.

There are any number of important questions which can usefully be asked and answered by such a review. How many near-misses were, for instance, reported by B.E.A. and B.O.A.C. crews during the first six months of 1961—and what were their causes? How many lightning strikes (with material, if unimportant, damage) were reported during the same period? Is enough being done to make sure that, one day, the little hole in the skin of the elevator (or aileron) will not be burned in some rather more important part of the structure?

And what about the initial handling difficulties experienced by the civil aircraft manufacturer's test pilots? These, too, should be recorded (if not in *Focus*) and followed up as an essential link in the total air-safety chain of an information dissemination service.

Air *v.* Surface—The Minister's Ruling

THE Minister of Transport has made clear that in his view the Air Transport Licensing Board is both empowered and required to take into consideration the question of wasteful competition between surface transport and any proposed new air service. That the Board was so required was, as we reported in our issue for Oct. 12 (p. 476), the principal submission of British Railways in their objection to the B.E.A. low-fare services on domestic trunk routes, which the Board subsequently approved (see our previous issue, page 539). Now that the Minister has given his ruling on this point, British Railways may well appeal against the latter decision, although such a move would not prevent B.E.A. from inaugurating their services as planned on Nov. 1. If an appeal were upheld, the Minister would then instruct the A.T.L.B. to revoke the licence.

Clarification of the Board's duties came last week when the Minister accepted his Appeal Commissioner's finding in the case of the British Transport Commission versus Morton Air Services. British Railways had appealed (see our issue for Sept. 28, p. 422) against an A.T.L.B. decision to license Morton for unlimited services between Swansea and Birmingham, on the grounds that such unlimited operations would result in serious injury to the Railways' interests. There was no objection to the service if limited to one round trip a day.

The Commissioner, Sir Ralph Hone, recommended that the appeal be dismissed because he was "not satisfied that the evidence did disclose that the Railways would suffer injury to the extent suggested" and because, in his opinion, the Board was neither empowered nor required by the Act to consider this issue. Although the Minister accepted the finding, he disagreed with the Commissioner on this latter point, and in so doing made his own views known for future reference.

British Aircraft for Italian Airlines

PREPARATIONS are being made by two independent Italian airlines to begin operations within the next few weeks. In the case of Itavia, this will be a resumption of services, which were suspended a year ago after the loss of a Heron on the Rome-Genoa route. The other operator is Aviolinee Siciliane, a newcomer to the domestic Italian scene.

Itavia has been disposing of its fleet of five Herons and a Dove, and at the time of writing has only one Heron remaining. The Dove was sold last year to Metropolitan Air Services in the U.K., and one of the Herons has gone to Executive Air Transport of Manchester. Two other Herons have been sold to Aviolinee Siciliane, while the fourth has gone to Handley Page as a trade-in on the deal built around the purchase by Itavia of two Herald 200s for 1963 delivery.

Pending delivery of the Heralds, Itavia is to operate with two ex-Transair DC-3s purchased from British United Airways. At present undergoing a maintenance check by Fields at Wymerswold, they will go into service next week. An option has been taken on a third DC-3. The routes on which Itavia will operate will include Rome (Urbe)-Pescara and Rome-Genoa, plus others at present under discussion with the Italian Directorate of Civil Aviation.

Aviolinee Siciliane has been set up in the first place to fly local services to Sicily. With its headquarters and maintenance base at Catania, it is to fly on routes from Catania to Reggio Calabria, to Palermo and to Ragusa and Gela. From Palermo a service will be flown to Trapani and the island of Pantelleria. At Palermo, both the new airport of Punta Raisi and the older one at Boccadifalco will be used. The fleet comprises three Herons, two purchased from Itavia and one from de Havilland; all three have been at Leavesden for major overhaul, and the first was delivered to Sicily last week.

The Handley Page Herald will be demonstrated at Catania on November 10 in the course of its Italian tour, as reported in our previous issue.

Another Italian independent company which recently began operations is Transavia. Based in Milan, this company is specializing in the transport of newspapers within Italy. As we reported last week, Transavia had the misfortune to lose one of its aircraft, an SIAI-Marchetti SM 102, on Oct. 22.

The Growth of Aeroflot

IN the course of his 50,000-word (in the English translation) address and report to the 22nd Congress of the Soviet Communist Party last month, Mr. N. S. Khrushchev devoted just one sentence to civil aviation in Russia. He said: "The civil air fleet, equipped with giant airliners, carries about 100,000 passengers a day." This nicely rounded figure can perhaps be safely translated as meaning more than 30 million passengers a year.

Accurate statistics for Aeroflot operations have been virtually unobtainable until recently, and even now the few published facts allow no real comparison with other operators. Recent information from Russia is that Aeroflot traffic increased from 4.2% of the total traffic of all 83 ICAO member countries in 1952, to 11% in 1960. If the term "traffic" means tonne-km. flown, then the 1960 Aeroflot figure would be 1,355 million.

By comparison, the total U.S. scheduled airline industry flew 7,300 million revenue tonne-km. in 1960. In relation to

OLDEST AIRLINE RE-EQUIPS.—Avianca (Aerovias Nacionales de Colombia), the oldest airline in the Americas, will soon add two Boeing 720Bs to its fleet. The first Avianca 720B is seen here on its first take-off from Renton.

Air Transport . . . .

this order of tonne-km., the number of passengers mentioned by Mr. Khrushchev seems very high indeed and, if accurate, indicates either an unusually low average passenger-journey distance in Russia, or, more probably, calculation of the passenger total on the basis of sectors flown rather than through journeys.

In 1960, Aeroflot's fleet included 42% turboprop and turbojet types, and 58% piston. The proportions are planned to change this year to 60% and 40% and, by 1965, to 90% and 10% respectively.

Lower Landing Minima for U.S. Jets?

THE Federal Aviation Agency, which lays down weather minima for operations by U.S. airlines, has proposed a reduction in the minima for jet landings. At present, these are 300-ft. ceiling and ½-mile visibility; the proposed reduction to 200 ft. and ½-mile would bring the minima more into line with those of non-U.S. operators, some of which are free to establish their own safe limits. Minima for British airlines are set by the Ministry of Aviation.

Any relaxation of the present F.A.A. rules will be accompanied by stringent conditions for the standards of airports and aircraft equipment, and pilot proficiency. The proposed new regulation, which is now being considered by the U.S. airlines, would, for instance, permit the lower minima to be used only at airports having complete ILS or PAR, a high standard of approach lights, a maximum glide-slope angle of 3°, and a runway length 15% (or at least 1,000 ft.) greater than the normal required distance.

The aircraft would need to carry a flight director or approach coupler and a proven warning system to detect flight-instrument failures.

Crew proficiency requirements would include at least 300 hr. on the aircraft type, plus training in an ILS approach to 200 ft. without the use of a flight director; an approach to 100 ft. with flight director or coupler, followed by a landing or simulated landing; and an engine-out missed approach procedure from 100 ft. in other than landing configuration. New rules are also proposed for the checking of pilot proficiency in bad-weather operations by F.A.A. inspectors.

IATA Reports

COMPREHENSIVE reports were presented at the IATA Annual General Meeting in Sydney last week covering the work during the year of the various committees. Although the sessions at which these reports were presented by the committee chairmen were private, summaries were published subsequently.

As we noted in our issue for Oct. 19, the Technical Committee's report on the supersonic air transport was a highlight of the week, although it contained no positive conclusions. The supersonic symposium in Montreal had, however, underlined certain urgent necessities. These included the need to evaluate noise levels and subjective reactions connected with the sonic boom, and for thorough research into the behaviour of aircraft materials when exposed to high temperatures for long periods of time. The airlines' minimum requirement was for a guaranteed 30,000-hr. airframe life. In this respect, the current development of the B-70 bomber was of a certain importance to civil air transport because of its closeness in size and general configuration to that of a transport aircraft.

A great deal of solid achievement in other areas was reflected in the Technical Committee's report. The reference document on noise abatement procedures had been published, and proposals for a new standard table of dimensional units have been accepted by ICAO for consideration by member states. Also being circulated by ICAO are IATA proposals to amend standards relating to obstructions in the vicinity of aerodromes.

Progress has been made in the all-weather landing programme, and during the year ICAO has endorsed the IATA recommendation in respect of the U.K.-developed VGSI. The Technical Committee warned against the use of this aid as a noise abatement measure by setting the approval angle at some figure above the optimum—as was being attempted in some quarters.

The IATA reference document on cockpit instrumentation and layout is being considered throughout the World and basic chapters of a handbook on production planning and control have been produced and circulated.

To speed up the transmission of messages between the airline teleprinter networks, a standard interline message format and procedure have been agreed by all IATA and ATA members. A code language has also been developed by which electronic data-processing machines and computers in the individual airlines can talk with, and be understood by, one another over the linked teletype circuits. This message format was implemented on Oct. 1 and provides a common reservations language with a vocabulary understood by machines as well as humans. Eventually it is hoped to achieve a means of high-speed data interchange between computers for reservations, maintenance, spares inventories, stores and supplies, finance and accounting.

Growing use of computers was also discussed in the Financial Committee's report. A sub-committee concerned only with data processing has been examining, among other things, the possibility of airlines exchanging certain types of records, such as tapes and cards, in place of conventional invoices and other detailed listings.

Increasing charges for airport and air-navigation facilities were a matter of concern to the Financial Committee, which has asked its Charges Working Group to circulate a comprehensive questionnaire to members in order to obtain information on this problem. The collection by governments of any form of origin and destination statistics is opposed by IATA, which also opposes their collection—if governments insist on it—at airports, as this would be time-consuming and costly.

Balance sheets and profit and loss statements are now supplied by member airlines to IATA, which this year has produced for the first time a new annual document entitled "Financial Statements of the IATA Member Airlines."

Among the points made in the reports on Traffic Conferences was that reductions in fares agreed during the past 12 months were expected to pay for themselves in terms of increased passenger and cargo traffic by 1963. The three conference meetings which had been needed to achieve agreement on Atlantic cargo rates were described as one of the most severe tests put to the Traffic Conference machinery, and Mr. V. H. C. Dubourg, chairman of four conferences during the year, advised airlines to "show speedier grace to compromise." He said "A little patience, a little anticipation and some collective forethought . . . might well have eased the difficulties . . . I personally believe that a solution of the major questions acceptable to the great majority must finally be acceptable to all."

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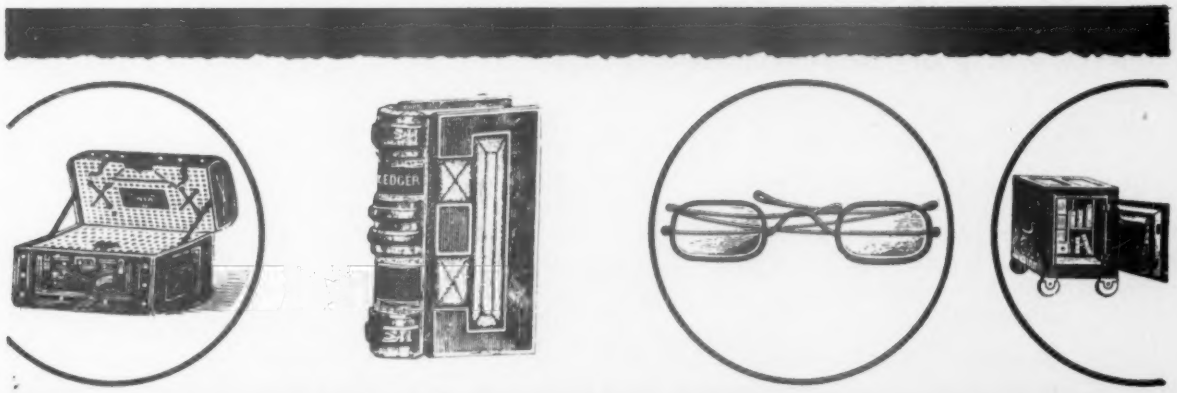

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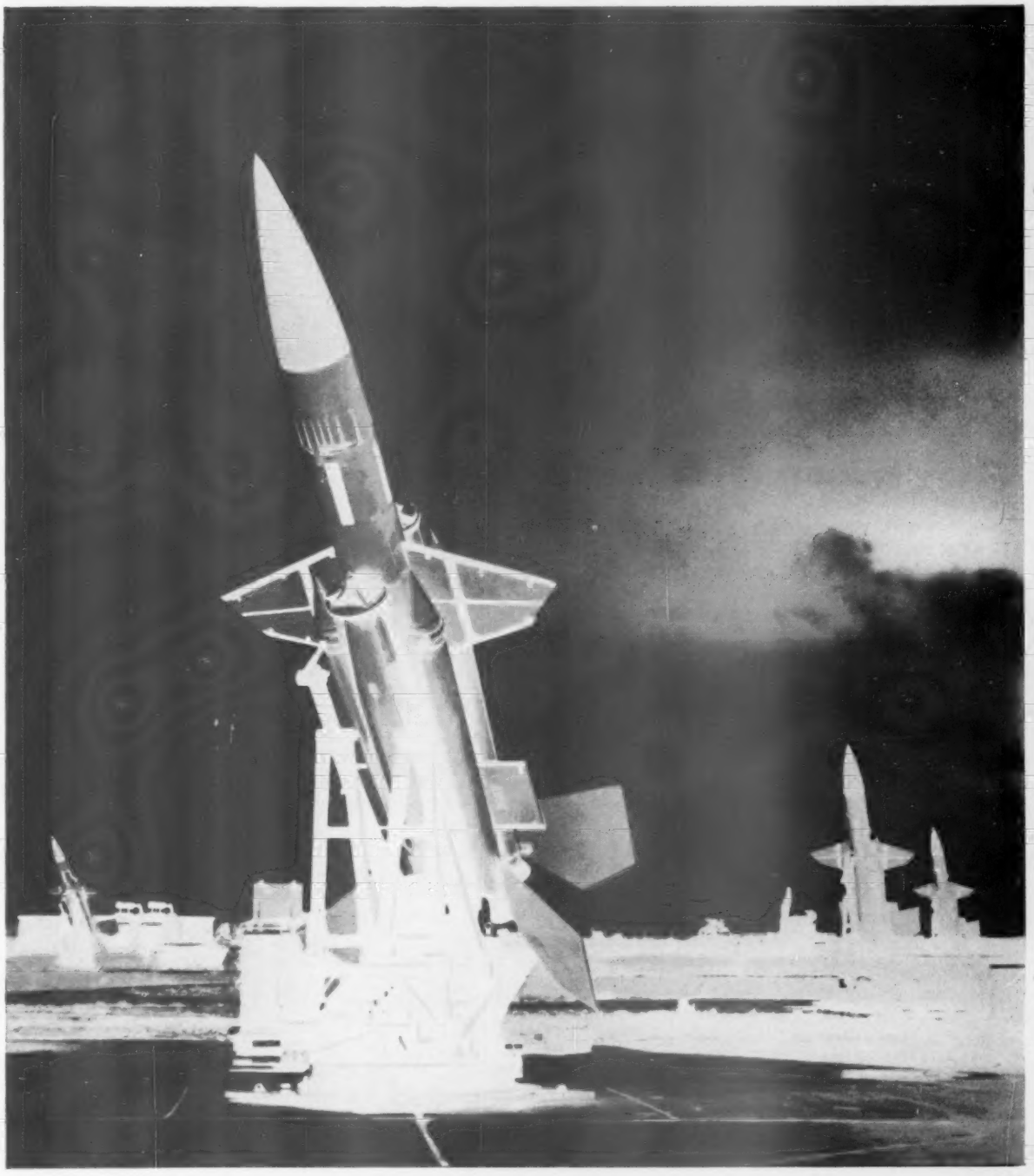

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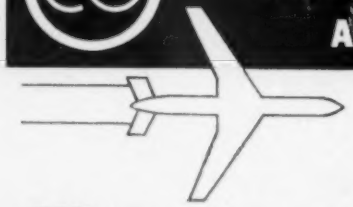

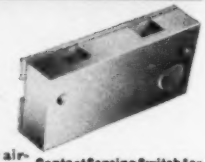

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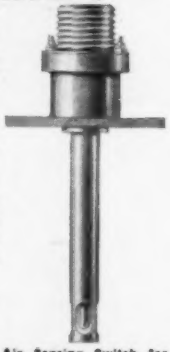

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Air Transport . . . .

Luton as an Alternate

K.L.M. last week designated Luton as its No. 1 alternate for London (Heathrow) Airport. It is the first airline to do so following the opening of the 5,532-ft. runway. Luton will replace Southend as K.L.M.'s principal diversion airport, the latter having been the No. 1 alternate for the past four years or so. Both Southend and Gatwick will continue to be used by the Dutch airline as necessary, and the status of Stansted is unchanged as the principal U.K. terminal for K.L.M.'s Atlantic charter flights by DC-8.

Reasons for the change from Southend to Luton are the growth of traffic at the former, and the good surface connections between London and the latter. Total aircraft movements at Southend in 1960 were just short of 70,000, of which nearly half were air transport movements; Luton had just over 29,000 movements, of which only 688 were air transport. Southend's growing popularity as a diversion airfield also increases the traffic—sometimes to saturation point when London Airport is closed.

Although the road and rail approaches to Southend are good, its position on the opposite side of London from Heathrow has been an inconvenience to K.L.M. Luton is approximately the same distance both from the K.L.M. town terminal and from London Airport. It is also advantageously situated in relation to the normal K.L.M. approaches to London by way of Clacton and Watford.

A study of Luton's weather shows that it is frequently in the clear (because of its 500-ft. elevation) when London Airport is closed by ground mist or fog. When Luton is closed by low cloud London is normally open. The one runway at Luton has modern night lighting, including VGSI, as well as D/F and surveillance radar.

Independents out of Business

MR. CYRIL CLAYDON, chairman and managing director of Pegasus Airlines, announced last week that his company would cease operations forthwith. Notices have been given to between 50 and 60 members of the staff, including aircrew and ground staff at Gatwick. Pegasus Airlines was the operating name used by Claydon Aviation, Ltd., which was incorporated in December, 1958, with a nominal capital of £2,000. It has been operating charter flights with three Vikings and late last year began flying a scheduled service between Blackpool and Gatwick.

Commenting on his decision, Mr. Claydon said that small operators could not obtain licences and "do not know where they stand." The Minister had said that airlines must amalgamate, but "none of the big boys will take small firms like mine, because they are waiting for us to die out." Claydon Aviation is to continue in existence, and will hire the aircraft out to other operators. "That way," said Mr. Claydon, "I shall make some money without any worries. I cannot say I have lost money, but I cannot say I have made any."

As we recorded briefly in our issue for October 12, the winding-up of Overseas Aviation (C.I.), Ltd., was ordered in the High Court on Oct. 9 on the joint petition of B.P. Trading, Ltd., and Rolls-Royce, Ltd. The creditors included these two companies, said to be owed £509,000; B.O.A.C., £109,000; and WAAC (Nigeria), Ltd., £13,000. B.P. Trading is being sued for a substantial sum by Overseas Aviation (C.I.) for breach of contract.

The bankruptcy proceedings against Overseas Aviation (C.I.), which had been initiated by WAAC (Nigeria), Ltd., in Jersey, were withdrawn early in October because the company had no assets in Jersey.

Another of the Overseas group of companies, Overseas Aviation Engineering (G.B.), Ltd., went into voluntary liquidation on Oct. 5. A statement presented to a meeting of shareholders showed unsecured liabilities of £147,211 due to 385 creditors. Another £42,695 was due to preferential creditors, and assets were estimated to realize £48,630.

The A.T.L.B. revoked, at the end of September, 14 "A"-class (scheduled), 23 "B" and one "E" licence held by Overseas Aviation (C.I.), Ltd. The company has withdrawn applications which had been lodged with the A.T.L.B. for 17 "A," 90 "B" and one "E" licence.

Last week, Keegan Aviation, Ltd., announced that one of its associated companies had purchased the fleet of Canadair North Stars which had been acquired earlier this year by Overseas Aviation. The purchase of aircraft and spares was arranged direct between Keegan and T.C.A., and five of the North Stars are now available for inspection at Coventry Airport, to which they were flown from Gatwick on Oct. 21.

An Annual Report from British United

FOR the first time, a major British independent airline has published its annual report and balance sheet. As private companies, the independents are under no legal obligation to do so, but British United Airways' decision is welcome and, it is to be hoped, will set a precedent.

In summary, the accounts show that the B.U.A. group achieved a trading profit of £401,962 in the calendar year 1960. The net profit (before tax) was £430,784, compared with £301,976 in the previous year, and this figure was arrived at after writing off £86,165 for compensation of redundant staff and other non-recurring expenses arising out of the merger between Airwork and Hunting-Clan Air Transport.

After allowance for tax and 20% dividend, the balance for year 1960 was £365,569, to make a total, with the balance, brought forward from the previous year, of £665,854. Against this balance, the company has written off the sum of £547,840 as goodwill in respect of the acquisition of the Bristow and Fison-Airwork Helicopter companies and the merger with Hunting-Clan. This item represents the excess of the purchase price of these companies over the net book value of the assets at the date of acquisition, and brings the total goodwill written off over four years to £1,180,555. The balance carried forward to 1961 was £118,014.

The extent to which the B.U.A. group has grown since 1959, as a result of the mergers, is shown by the consolidated balance sheet, the total liabilities having increased from £9,256,722 to £16,021,016. The authorized share capital is £510,000 (£509,432 fully paid up), and capital and revenue reserves total £4,313,630. Unsecured loans total £4,727,196.

The company's assets include £9,012,405 in respect of aircraft and £1,394,319 for other fixed assets, and current assets of £5,309,127. B.U.A. is now the third largest British air transport organization, employing over 3,000 people.

The shareholders in B.U.A. are British and Commonwealth Shipping Co. (Aviation), Ltd., and The Clan Line Steamers, Ltd., 31.72%; Furness Withy and Co., Ltd., 19.47%; Blue Star Line, Ltd., 19.47%; Broadminster Nominees, Ltd. (Whitehall Securities), 9.73%; Guiness Mahon Nominees, Ltd., 9.73%; Hunting Aviation Management, Ltd., 7.74%; minorities, 2.09%.

The full list of British United Airways companies is as follows: Air Charter, Ltd.; Air Hire, Ltd.; Airwork International, Ltd.; Airwork Services, Ltd.; Aviation Traders, Ltd.; Aviation Traders (Engineering), Ltd.; Bristow Helicopters, Ltd.; Bristow Helicopters (Eastern), Ltd.; British United Airways, Ltd.; British United Airways (Services), Ltd.; Channel Air Bridge, Ltd.; Dishley Engineering, Ltd.; Hunting-Clan Airservices, Ltd.; Hunting-Clan Air Transport, Ltd.; Morton Air Services, Ltd.; Morton Engineering Services, Ltd.; Olley Air Service, Ltd.; Surrey Flying Services, Ltd.; Terminal Travel (London), Ltd.; Transair, Ltd.; Airwork (East Africa), Ltd.; Bristow Helicopters (Bermuda), Ltd.; Helicopter Rentals, Ltd.; Straits Air Freight Express, Ltd.

Falcon in Suspension

OPERATIONS by Falcon Airways have been suspended for the winter and may be resumed next spring on a different basis. The Ministry of Aviation announced last week that Falcon's air operator's certificate was "withdrawn on safety grounds by the Director of Air Safety on September 21, as a result of the running down of the company's operations in this country." On the same day, Falcon notified the Ministry of its intention to cease operations.

Falcon has been operating this year with two Constellations. According to Capt. Kozubski, managing director of the company, these may be sold and more modern equipment obtained to undertake long-range charters next year. It is open to the company to reapply for its air operator's certificate at any time.

The company was founded in December, 1958, and has a nominal capital of £100,000, of which £25,000 is issued. Capt. Kozubski holds approximately 66% of the shares, the remainder being distributed between six other directors and seven other shareholders.

In June, Falcon appealed against the decision by the Director of Aviation Safety restricting its air operator's certificate to Region C (Europe and the Black Sea). This appeal was to have been heard on July 12 but was withdrawn by Falcon on July 7 following "changes within the company."

On July 14, Falcon was refused permission by the Ministry to operate an Austrian-registered Constellation for inclusive tour flights from Gatwick (see our issue for July 27, p. 98). Permission was subsequently granted for the use of this aircraft.

Early in July, Falcon appealed against a decision by the A.T.L.B. rejecting its application for a Class "B" licence for flights to Tangier. This appeal was heard on Aug. 21 and was rejected (see our issue of Sept. 28, p. 422).

At the beginning of September, fines of £300 were imposed on Capt. Kozubski and Falcon Airways in respect of a flight from British Guiana to the U.K. (Issues of Sept. 7 and 14.)

Air Transport . . . .

Helicopter Service for Washington

EIGHT companies have applied to the C.A.B. for authority to fly scheduled helicopter services in the Washington area, linking Washington National, Dulles International and Baltimore's Friendship airports. The Board was to hear the applications late last month, but is not expected to make its decision known until next year. Particular interest surrounds the case, as it is the first for eight years involving helicopter operations.

Only three airlines—New York Airways, Los Angeles Airways and Chicago Helicopter Airlines—at present have unrestricted certificates for scheduled passenger helicopter operation in the U.S. and all are heavily subsidized. The decision in the Washington case is likely to revolve around the subsidy issue and may set the pattern for future helicopter route awards. None of the applicants expects to be able to operate the Washington services free of subsidy at first, but the use of new types of turbine-engined helicopters may make it possible to limit the period of subsidized operations.

The applicants, with their proposed helicopter fleets, are: Allegheny Airlines (five Sikorsky S-58 at first, larger types later); Chesapeake and Potomac Airways (three Boeing-Vertol 107); D.C. Helicopter Airways (four Sikorsky S-62); D.C. Transit System, an existing surface transport company (two Boeing-Vertol 107 and four Sikorsky S-62 or Bell 204B); New York Airways (three Boeing-Vertol 107); Piedmont Aviation (three Boeing-Vertol 107); Pilgrim Helicopter Services (five Sikorsky S-62); and Washington-Baltimore Helicopter Airways (two Sikorsky S-62 and two Boeing-Vertol 107, or two Sikorsky S-61).

Financing a Jet Purchase

DETAILS of the contract between National Airlines and Douglas Aircraft Co. for the purchase of six DC-8s give an indication of the lengths to which manufacturers must now go to obtain airline orders. The contract is for six turbofan-engined DC-8 Series 50s, which National needs for its recently certificated transcontinental routes between Tampa and Miami in Florida, and Oakland, Las Vegas, Los Angeles and San Diego in California. These aircraft are in addition to three DC-8 Series 20s which National already has in service, and are for delivery between March and November, 1962. The price of the six new aeroplanes is $31,800,000.

According to a recent issue of *Aviation Week*, National has obtained the use of the Douglas turbofan demonstrator from October this year to allow an earlier start to be made with the new aircraft. This particular DC-8 can be traded back to Douglas after delivery of any of the first three of National's own DC-8s, and the airline will pay the difference between its full value and its trade-in value according to the length of service. This is expected to work out at about $385,000 for six to eight months of operation.

National also has the option to trade-in its three present DC-8s against three of the new aircraft. Douglas will allow between $12 million and $13 million for these DC-8s, which National will then lease back from Douglas at a rate of payment which would reimburse Douglas over eight years and add 6% interest. This arrangement in fact represents an eight-year loan of some $12 million by Douglas—with the aircraft used as security.

In addition, Douglas has agreed to accept a note from National for another $5 million, to be repaid monthly. This sum represents the difference between the total cost of the aircraft purchase (plus $2,528,000 for spares) and the cash which National can raise from the sale of subordinated debentures, the trade-in arrangements and depreciation.

Air-to-Ground Data Link

FROM studies and tests of an experimental air-ground communications system developed by the Radio Corporation of America, the F.A.A. and the A.T.A. have come to a number of conclusions regarding the operational and technical requirements for data link.

For example, the use of push buttons for communications between a pilot and an A.T.C. controller have been found to be not as easy or natural as conventional voice R/T for most functions; flexible format messages are required with printed copy for future reference; and data and voice should be transmitted on a single (multiplexed) R/T channel to enable existing airborne equipment to handle both services.

Based on these requirements a new aircraft communication electronic signalling system known as ACCESS has been proposed by a combined engineering team from Motorola and General Precision, Inc. In this proposed system the only extra pilot control box in the cockpit would be a small "insertion-display" unit containing four push buttons.

These would be employed automatically to transmit data link "aircraft identification/time over an assigned fix" messages; pilot acknowledgement of A.T.C. ground-to-aircraft messages; automatic monitoring of R/T voice conversations; and the transmission of an indication to an A.T.C. controller's radar display identifying an aircraft which wishes to talk to him. When the controller is free to talk to this aircraft, data link transmissions to the specific aircraft are to be used to raise the volume of its receiver and flash a light on the pilot insertion-display unit.

For the recording of met. and A.T.C. clearance messages a small airborne teleprinter may be employed with ACCESS. The first prototype of this unit is scheduled to be delivered by the Mitre Corp. in 1962 for F.A.A. evaluation.

FASTER TURNROUNDS.—The mobile scissor-lift intermediate-base loading platform developed by Canadair is seen here being demonstrated with a Seaboard World Airways' CL-44. The platform was illustrated with a drawing in our issue of Oct. 14, 1960, p. 531.

OPtional Reading—18

AT the age of 19 my ambition was to get into the Indian Police, then part of the Indian Civil Service, and one of the qualifications required was to pass an examination in horsemanship; so, having no money for riding school tuition, I obtained a job in a stable. After a somewhat lengthy period I was eventually allotted a horse, Acoustic of all names, and allowed to gallop with the best blood of the string.

Now Acoustic was 10, rather past his prime, but he had learnt several tricks which enabled him to get by. Going up to the starting gate he would buck and prance till the others were out of position and the starter had lost patience; then he was off with a 10-yard lead and would hold on to this till about half-way, when Blue Vein and Golden Ray and the rest would forge ahead; I could hang on all right in the en route stage but, when we came to the small paddock used as an overrun, he had a trick of ground looping and I invariably fetched up with my arms round his neck. And in the stable, too, he was tricky, sometimes manœuvring me into a corner and showing me his heels. After one such occasion, supplemented by a vicious bite on the arm, I voiced a mild complaint to the trainer. But this, I soon found, was a vast mistake; I got no sympathy at all and for weeks afterwards my name was mud in the stable —"just his little game; he is only playing; call yourself a rider?" I noticed that no one else offered to ride or groom him—though it must be said that each had a horse according to his weight and it was not customary to change around. And no doubt they had their troubles too.

The point I am making is that I was a prospective constable of Calcutta and the rest were prospective Gordon Richardses; our standards, training and future were not at all the same. Similarly the standards, training and future of the airline pilot are not at all the same as those of the test pilot. The latter, choosing a dry day with smooth air, can bring his jet over the hedge on three consecutive occasions at 1.3Vs, put it down about 500 ft. along the runway and fetch up half-way down the strip; but the airline pilot cannot choose his day and, as he did not train to become a test pilot, he has more difficulty in hitting off the exact threshold speed; the result is that threshold speeds and landing distances in day-to-day operations vary over a wide range.

As indicated earlier (OPtional Reading 16), I expect shortly to have some useful data on pilot variability, but I am mentioning it here because it is necessary to stress that the calculations made previously in connection with the landing problem take no account of pilot variability; we have been considering only aeroplane variability or, as I have preferred to say in order to cover gust effect, the "flight variables."

Let us get these squared away before we go on to pilot variability.

In OPtiontal Reading 14 I wrote: "spreading the argument out a bit may also give an opportunity to my designer friends (if by now I have any) to amend the record as we go along." It seems that I have at least one designer friend and he has tipped me off that the *g*-loads selected in OPtional Reading 15 —namely 0.2 to 0.4—are on the high side for the jet. At the time I said that the figures were based on piston-engined experience and were all I could find; however, now that I have some jet data, I propose to rework my sums on the basis of 0.15 to 0.3 *g*, which are, I am informed, more representative of the operation of today's jets. Of course, one is left with the question as to why pilots pull noticeably less *g* when flaring a jet than when flaring a piston-engined aircraft, and it may well be that they do so because there are not many *g*s to pull—i.e. pulling at 0.3 or 0.4 would introduce a risk of meeting the high sink condition.

For this reason I propose, in the table emerging next week, to calculate the probability of landing short, using *g*s of 0.15 to 0.43 and winds of 6 to 30 kt. I believe that the figures which will appear represent a fair enough picture but I would point out that I am not an aerodynamicist nor a mathematician. I know now, as I come to consider the intricacies of landing a modern aircraft, that at the age of 19 I ought to have been studying curves of normal distribution and curves with lepto-kurtotic tendencies, but, although I paid some attention to the latter, I did not recognize their mathematical significance and have fetched up with a great respect but very little understanding of the work of Cook and Weaver, on which the philosophies of British performance standards are based. But I can understand the first sentence of their gospel (reproduced as ICAO Doc. 6078-AIR/514), which reads: "The ability to manœuvre may be regarded as an essential feature of an airworthy aeroplane and consequently any code of airworthiness requirements must include manœuvrability standards"—in our present context, *g*-effect on the stall.

Clever characters, Cook and Weaver; but for guidance on the pure maths side of the subject I find little help in the literature of the industry (because impure maths are more applicable?) and have turned for advice to my 18-year-old daughter who is taking the subject for a university scholarship. Using this, some "Tables for Statisticians and Biometricians" and the figures and assumptions given in OPtional Reading 13-17, modified a little as described above, I have arrived at an assessment of the probability of the *aircraft* landing short—not the *pilot*. I am ignoring for the moment any question of pilot variability (usually, but often erroneously, called "pilot error").

By the way, I did not get as far as the riding test for the Indian Police; I did quite well in the academics but poorly in the *viva voce*; somehow the interviewing board seemed to get the idea that I was not exactly the Pillar of the Establishment which they were looking for.—C.C.J.

[There was a misprint in last week's OPtional Reading (No. 17). In the third paragraph, seventh line, the gust-effect Standard Deviation should have been 0.34 (not 3.4) times the mean wind speed.—Ed.]

B.E.A. Traffic Recovers

IN August, B.E.A. carried 14.3% more passenger traffic than in the same month of 1960. This was among the lowest rates of growth this summer but was a record month in terms of passengers carried. At more than 590,000, the total exceeded the annual uplift by B.E.A. in 1948-49.

This indication of at least a partial recovery from the July slump is encouraging but has to be viewed in relation to the big increase in capacity offered by B.E.A. With all the Comets delivered and the Vanguard fleet still growing, the Corporation offered 22.8% more ton-miles this August than last, and the revenue load factor consequently fell by six percentage points.

The big increase in capacity was inevitable with the introduction of the new aircraft, and any attempt to trim capacity to match the traffic would have had an even more serious effect on aircraft utilization. In the latter respect, B.E.A. has been doing rather well. In their first year of operation, the Comets averaged 2,026 hours each, and by the end of August the utilization rate had gone up to 2,132 hr. per year, compared with the best-ever B.E.A. figure of about 2,600 hr. now being achieved with the Viscount 800s. As noted in our previous issue, the Vanguards were flown at an average rate of 1,564 hr. a year for the five months from April to August.

TRAFFIC RESULTS—AUGUST, 1961

	August, 1961	August, 1960	Variation
Capacity ton miles offered	32,522,000	26,481,000	+22.8%
Load ton miles sold	20,873,000	18,568,000	+12.4%
Revenue load factor	64.2%	70.1%	− 8.4%
Passengers carried	590,656	522,353	+13.1%
Passenger miles flown	206,864,000	180,975,000	+14.3%
Passenger load factor	68.4%	74.9%	− 8.7%
Freight ton miles	1,291,100	1,179,600	+ 8.6%
Mail ton miles	304,200	319,600	− 4.8%
Aircraft miles flown	4,598,600	4,524,000	+ 1.6%
Revenue hours flown	20,507	22,046	− 7.0%

Central African Continues Profitable

FOR the second year in succession, Central African Airways has achieved a net profit on its operations, without government subsidy. The profit of £127,032 was made despite a number of difficulties, including the temporary grounding of Viscounts earlier this year and the slow growth of domestic traffic.

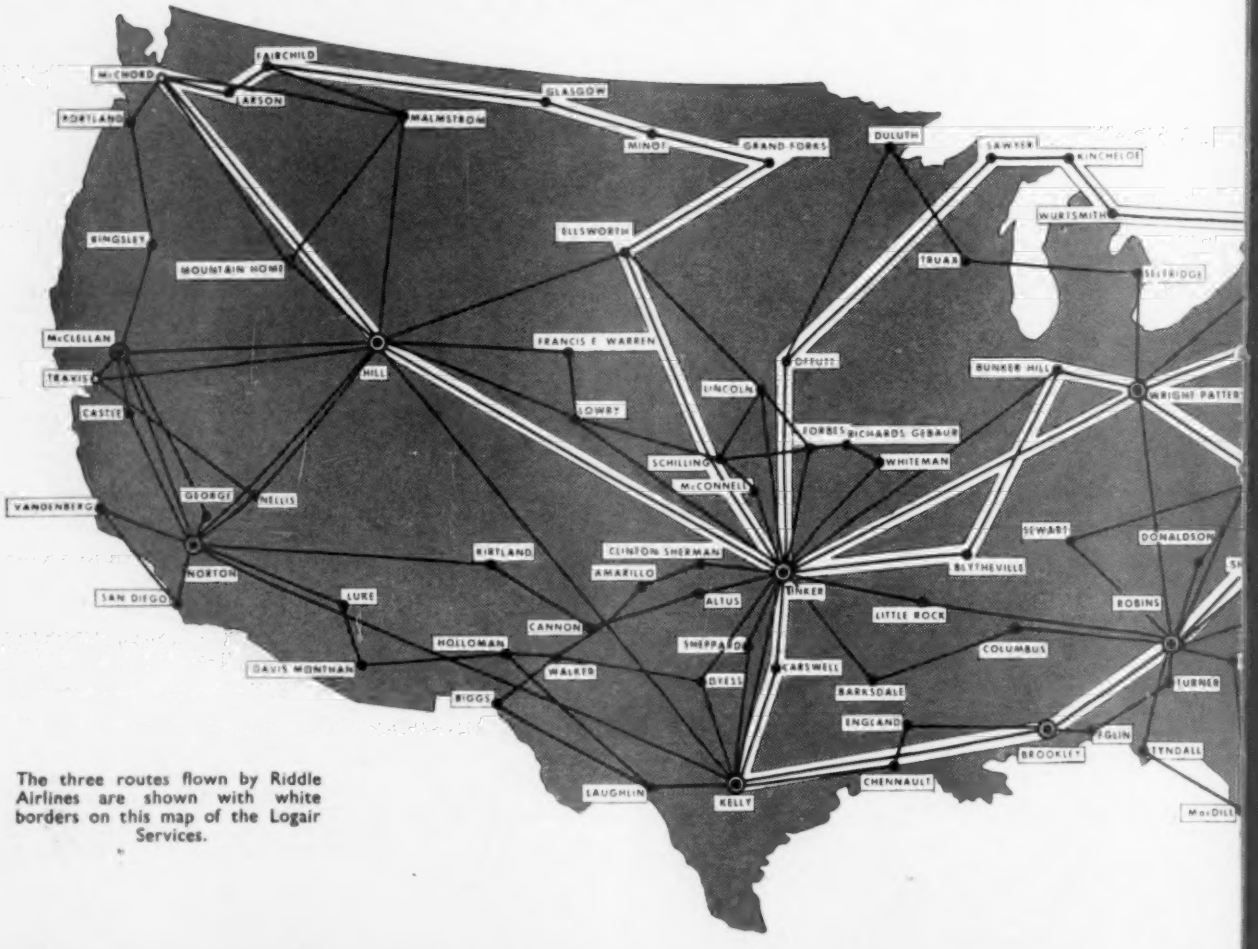
The number of passengers carried in 1960/61 (the C.A.A. "year" ends on June 30) was 201,004—an increase of 13% over the previous year, and freight increased by 14% to 2,110 tons. The company achieved a 6.8% increase in revenue, but held its operating expenditure to within a fraction of one per cent. of the previous year's figure. The excess of income over expenditure made it possible to establish insurance reserves and asset-replacement reserves of £50,000 and £100,000 respectively. Loan repayments totalled £253,350 and interest on loans, £142,893.

During the year, C.A.A. purchased a fifth Viscount and continued to expand its Viscount services within the Federation. Good results were obtained in the development of low-fare services and inclusive tours to coastal resorts. Unprofitable services were continued with Beavers in Barotseland and Nyasaland, and marginal DC-3 services were maintained in other areas as part of C.A.A.'s contribution to the development of the Federation.

"Break-through in Commercial Aviation"

Visitors examining the automatic conveyor system at Tinker A.F.B.

Seven British A.W.A. Argosy fr
Riddle Airlines now operating th
Logistic Airline around the U.S.
Astronautics", page 521 Oct. 1
demonstration at Tinker Air For
on Oct. 11, Senator Mike Mon
said that the introduction of the
services was another break-thr
tion. He also expressed the vie
make possible costs of 5-6 cent



The three routes flown by Riddle Airlines are shown with white borders on this map of the Logair Services.

ighters are in service with ee routes of the U.S.A.F. (see "The Aeroplane and 9 and map below). At a ce Base, Oklahoma City, roney is quoted as having Argosies into the Logair ugh in commercial avia- that the Argosies would per ton mile.

Above, Mr. Robert M. Hewitt (left), Riddle Airlines President, and Senator Monroney.

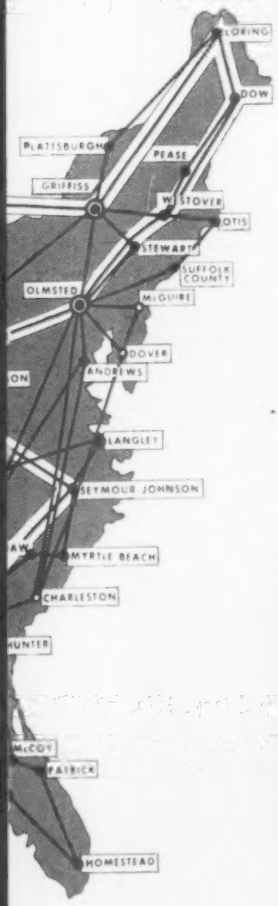
Full use is made by Riddle of the Argosy's double-end loading capacity. Freight is loaded on pallets and brought out to the aircraft on this specially built roller-floored trailer. A load of 18,000 lb. was loaded in some 10 minutes.

Three phases showing the loading of the Argosy during the demonstration at Oklahoma City:

Above right, rolling the load off the trailer.

Right, pushing the last load home.

Below, visitors examining the Argosy which was fully loaded in 10 minutes.



The Fighting Services

Senior Command Changes

A NUMBER of senior Air Ministry and Command appointments, some of which were briefly recorded last week, have recently been announced.

Air Chief Marshal Sir Edmund Hudleston, K.C.B., C.B.E., is to become A.O.C.-in-C., Transport Command, in March of next year. At present Vice-Chief of the Air Staff, he was R.A.F. Instructor at the Imperial Defence College from 1956 to 1957. From 1953 he was A.O.C., No. 3 Group, Bomber Command.

The post of Vice-Chief of the Air Staff is to be taken over by Air Marshal Sir Wallace Kyle, K.C.B., C.B.E., D.S.O., D.F.C., A.D.C., in February. He has been A.O.C.-in-C., Technical Training Command, since September, 1959, and was previously Air Officer Commanding, Malaya. From 1952 to 1955 he was Director of Operational Requirements at the Air Ministry.

Air Marshal Sir Alfred Earle, K.B.E., C.B., is to be A.O.C.-in-C., Technical Training Command, in succession to Air Marshal Sir Wallace Kyle. Commandant of the R.A.A.F. staff College in 1952, he was subsequently Assistant Chief of the Air Staff (Policy) at the Air Ministry and A.O.C., No. 13 Group, Fighter Command. He has been Deputy Chief of the Defence Staff since January, 1960.

Bomber Command changes include Air Vice-Marshal M. H. Dwyer, C.B., C.B.E., who has been appointed Air Officer in Charge of Administration, and Air Vice-Marshal B. K. Burnett, C.B., D.F.C., A.F.C., the new A.O.C., No. 3 Group. A.V.M. Dwyer has commanded No. 3 Group since May, 1959, and A.V.M. Burnett has been A.O.A. at Command Headquarters since January, 1959.

Air Vice-Marshal M. E. M. Perkins, C.B.E., has been appointed Director-General of Engineering in succession to Air Vice-Marshal G. Silyn-Roberts, C.B.E., A.F.C., who is retiring from the Service. A former Commandant of R.A.F. St. Athan, A.V.M. Perkins was previously S.T.S.O. at Headquarters, Bomber Command.

Two recent Air Ministry appointments are those of Air Cdre. H. N. G. Wheeler, C.B.E., D.S.O., D.F.C., A.F.C., who is to become Air Member of the Defence Research Policy Staff in January, and Air Cdre. P. C. Fletcher, O.B.E., D.F.C., A.F.C., as Director of Operational Requirements (B).

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. J. E. S. Morton, D.F.C., to the Department of the Air Member for Supply and Organization.

Fighter Command: Sqn. Ldr. D. R. Spilsbury to R.A.F. Middleton St. George as Senior Technical Officer, with acting rank of Wg. Cdr.

Transport Command: Wg. Cdr. R. B. Sillars to R.A.F. Colerne, to command No. 24 Squadron.

Flying Training Command: Wg. Cdr. F. Healey to No. 3 Flying Training School, R.A.F. Leeming, as Senior Technical Officer.

Technical Training Command: Gp. Capt. H. R. Edge, A.F.C., to Headquarters as Senior Personnel Staff Officer.

R.A.F. Germany: Wg. Cdr. J. A. Bush, D.F.C., to Headquarters for air plans duties.

Near East Air Force: Gp. Capt. A. B. Riall, C.B.E., to Headquarters as Senior Ground Defence Staff Officer.

Other Appointments: Wg. Cdr. R. B. Langlois, D.F.C., to the Ministry of Defence; Wg. Cdr. T. W. Horton, D.S.O., D.F.C., to Headquarters, Commander Maritime Air, Eastern Atlantic, for exercise planning duties; Wg. Cdr. R. P. Breen to Headquarters, 2nd A.T.A.F., as chief of organization and administration; Wg. Cdr. R. S. Sanders, D.F.C., A.F.C., to the office of the U.K. High Commissioner to Pakistan as Air Adviser, with acting rank of Gp. Capt.; Wg. Cdr. R. A. Simpson to the Pakistan Staff College as Assistant Commandant, with acting rank of Gp. Capt.

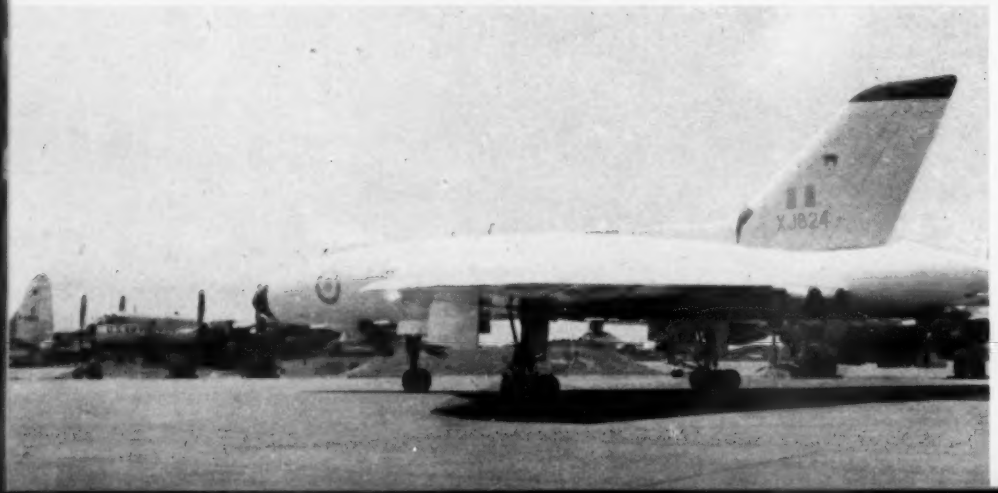
V-BOMBER TRIP.—Mr. Julian Amery, the Secretary of State for Air, completed his first flight in a V-bomber on Oct. 23 when he flew in a Victor B.1 from R.A.F. Gaydon. He is seen here with the aircraft captain, Flt. Lt. F. McClory.

More Service News

Jubilee Reunion.—Last week five pilots, Vice-Admiral R. B. Davies, Maj. H. A. Petre, Gp. Capt. H. A. Williamson, Air Vice-Marshal A. E. Borton and Lt.-Col. C. L'Estrange Malone, attended a reception given by Air Cdre. and Mrs. G. B. Dacre at Lord Fraser of Lonsdale's house in London. Like their host, Air Cdre. Dacre, all had qualified as pilots before the formation of the Royal Flying Corps in April, 1912.

No. 803 Squadron History.—A history of No. 803 Squadron, R.N., is being prepared by Sub. Lieut. C. J. Wilson, R.N., who is asking ex-members for any details of the Squadron's past history. Those who can help are asked to write to the Staff Officer, No. 803 Squadron, H.M.S. "Victorious," c/o G.P.O., London. Any photographs will be welcome, carefully looked after, and returned after copying.

Service Crests.—A board displaying R.A.F. crests has been presented to the Heir Apparent of Bahrain, Sheikh Isa bin Sulman Al-Khalifa, by the C.O. of R.A.F. Bahrain, Wg. Cdr. G. Newberry, to commemorate a recent visit paid to the station by Sheikh Isa. Besides the crest of R.A.F. Bahrain itself, the board carries the crests of various squadrons which had aircraft at Bahrain when the Sheikh paid his visit—No. 8 (Hunter), No. 37 (Shackleton), No. 30 (Beverley), No. 152 (Twin Pioneer) and No. 13 (Canberra) Squadrons.

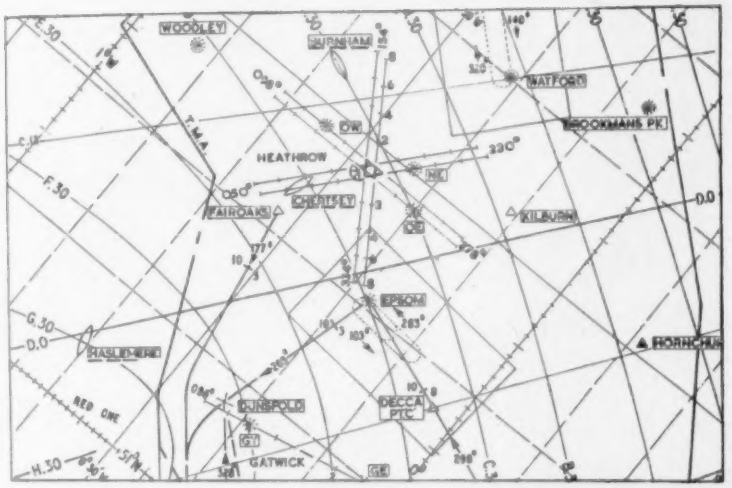


EXERCISE SKYSHIELD.—Left, a Vulcan B.2 from R.A.F. Scampton at Kindley A.F.B., Bermuda, in preparation for the recent combined SAC-NORAD air defence exercise "Skyshield II." Above, Air Chief Marshal Sir Kenneth Cross (right) and Air Marshal Sir Wallace Kyle being briefed on the exercise at the NORAD Combat Operations Center at Colorado Springs.

Decca Presentation Developments

FLIGHT trials of the prototype Mk. 1 version of the Omnitrac computer and the Mk. 3 Flight Log have now been completed by the Decca Navigator Co. Manufacture of a Mk. 2 production model of Omnitrac is expected to start in September of next year and the Mk. 3 Flight Log, now undergoing final development, is to go into production in about 4-5 months.

Omnitrac is a lightweight airborne digital computer weighing 50 lb. in its prototype form—and not more than 30 lb., including power supply unit, in its developed production version—designed basically to convert the hyperbolic position co-ordinates of the Decca receiver into rectilinear terms. Installed between the Decca receiver and the Flight Log, it enables undistorted charts of various projection to be employed in place of the standard Decca hyperbolic grid charts.



A section of an undistorted London-Paris chart for use with the Decca Mk. 3 Flight Log and Omnitrac computer. Produced on a conical orthomorphic projection, it has a scale of 1 : 500,000.

Apart from making the initial use of the charts easier, the main advantage of this rectangular display is in diversion flying, etc., when alternates and new tracks have to be found. The Omnitrac computer also has the facility to provide bearing and distance information relative to a "ghost" beacon which can be set up in any relative position by feeding in its selected cartesian co-ordinates. This information can, therefore, be made to represent a known VOR or other beacon, and is displayed continuously in meter form.

Doppler, inertial and D.R. navigational information can also be processed by the computer which has the ability to supply digital or analogue autopilot steering outputs.

Half the size of the prototype equipment, the Mk. 2 version will go into a case approximately the size of a ½-ATR. In addition to size and weight, the main difference between the prototype and production computers is that the Mk. 1 has a 32-track drum store and the Mk. 2 a core storage.

The Mk. 3 Flight Log has been developed with the object of reducing to a minimum the amount of pilot manipulation required when using Decca in flight. The setting-up process of selecting the required chart and bringing the pen to the point on the chart indicated by the Decometer readings required with the previous Flight Log versions has been replaced by the automatic correct positioning of the pen once the required chart has been selected and brought into view by pressing the appropriate button on the control box.

Employed in conjunction with Omnitrack, Mk. 3 Flight Log provides a comprehensive Decca system with undistorted presentation, ghost beacon facilities and completely automatic chart change. With one computer and twin Flight Logs, either pilot or co-pilot presentation can be selected.

Meteorological Radar Demonstration

LAST week Cossor Radar and Electronics gave the first public working demonstration of one of their C.R. 353 meteorological radars ordered last year for eight installations in New Zealand and Fiji.

A 10-cm. unit, the C.R. 353 in its basic form requires two operators to undertake wind-finding measurements, but with the addition of optional print-out units the manning requirement can be reduced to one person. In the wind-finding rôle, the radar is employed to track, manually or automatically, a passive reflector carried by a free balloon in the normal way. Three positional co-ordinates of the reflector are displayed on visual indicators on a data presentation unit.

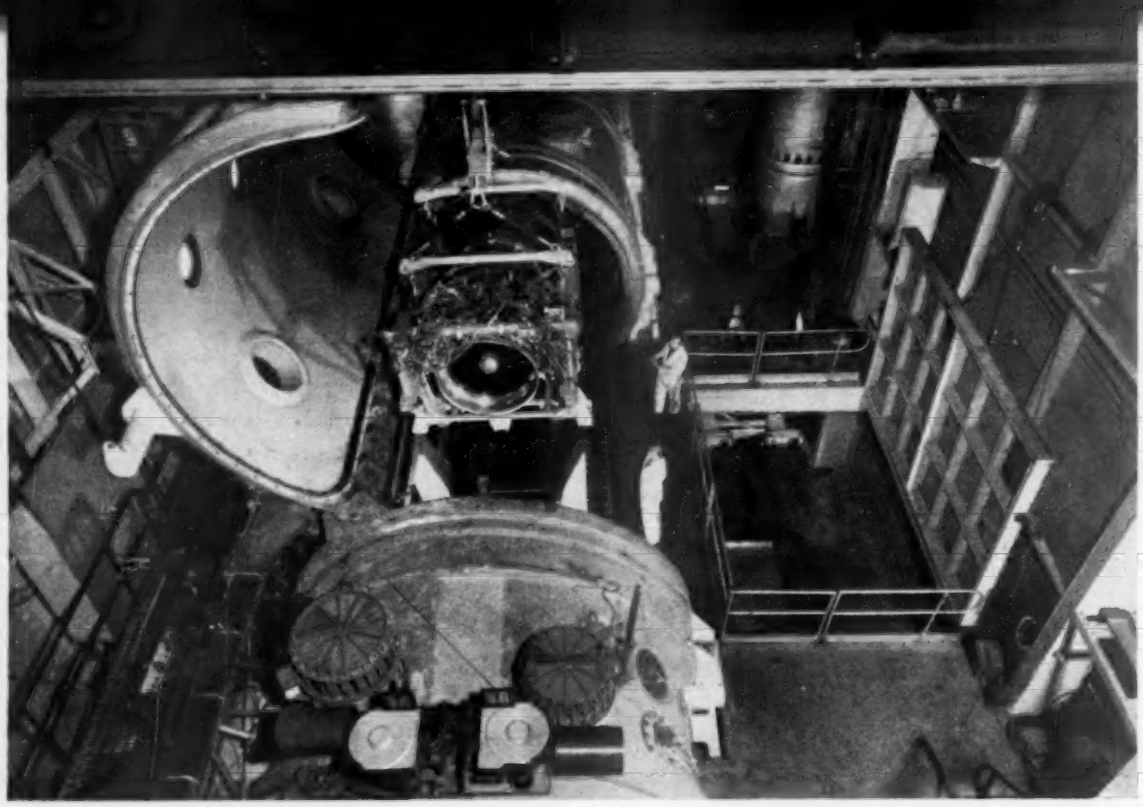
Right, inside the equipment building the operator seated at the left hand console records details of range, height and bearing. In the background are the transmitter and receiver. Left, the aerial of the C.R. 353 radar with a balloon carrying its passive reflector.

Bearing and elevation indications are given at intervals of 0.05° and the range indicator displays have a six-figure readout correct to the nearest 25 m. Maximum slant range for wind-finding work is 250 km. A timing device is also incorporated which provides timing pulses which freeze all the indicators at regular intervals for ease of plotting.

In addition to the automatic print-out unit for the recording of positional information, an optional addition to the data presentation unit is a computer to convert the slant range and elevation co-ordinates into ground range and height data.

For general weather observation the C.R. 353 has a 12-in. PPI unit incorporating iso-echo circuits which enable the operator to make cloud density determinations. Cloud heights can be estimated by varying the vertical tilt of the aerial.

In practice the maximum range of the equipment as a weather radar is about 200 n. miles. Intermediate switched range scales of 25, 50 and 100 n. miles are provided.

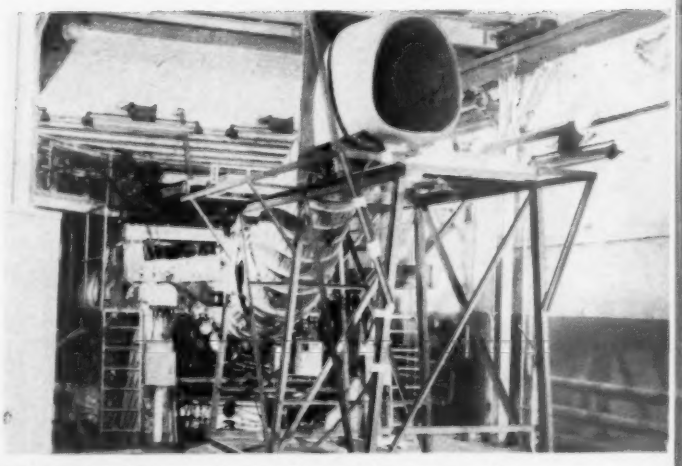


Progress with the Spey

FOLLOWING the news in our previous issue, that Braniff International Airways had ordered six One-Eleven short-haul transports from the British Aircraft Corporation, Rolls-Royce has given a progress report on the 10,000 lb.s.t. Spey bypass turbojets with which these and other aircraft will be powered. In addition to being chosen for the One-Eleven, Speys have also been selected for the medium-range de Havilland Trident turbojet transport and—in a military version—for the Blackburn Buccaneer S2 naval strike aircraft. Flight trials with two Speys installed in the inboard engine bays of an Avro Vulcan began at Hucknall on October 12.

The first test-bed runs of the new turbojet were initiated in December, 1960, at the company's Sinfin establishment and since that time more than 1,300 hours of running with test engines has been completed. These have included a preliminary 150-hour run to the combined Air Registration Board/Federal Aviation Agency type-test schedule.

Intensive endurance running has also been achieved using a fully equipped production-type Trident engine pod. This particular test, which was done at Hucknall, has included a 150-hour cyclic run and, say the company, has provided valuable experience on the engine and its installation features in the Trident. Relevant power and air "off-takes" for ancillary services have been applied in these tests and the functioning



Above, a Spey under a test using the long curved intake duct which leads to the centre engine in the three-engined Trident installation. The photograph at the top of the page shows a test Spey being lifted out of the altitude chamber at Sinfin.

Left, flight-test engines have been installed in the inboard powerplant positions of a Vulcan and flew for the first time on October 12.

Left, a new photograph of the Trident which shows the relative positions of the three intakes. Ground running trials in the airframe have been completed.

of the silencing and thrust reversing systems has been checked. These tests will clearly provide much useful data in relation to the One-Eleven installation which is said to be somewhat similar to that of the Trident.

As the centre powerplant for the Trident is "buried" with a curved intake duct from the top of the fuselage, environmental tests have also been made at Derby with intake ducting of this type fitted to a Spey in the test cell. Other tests that were done in August in preparation for the flight test programme have included some running in simulated flight conditions in the altitude chamber at Sinfin. These were selected to cover conditions appropriate to military as well as civil versions of the engine and included re-light tests at various altitudes and investigation of the Spey's windmilling and flight idling r.p.m. under various conditions.

As the Spey is principally intended for use in short- or medium-range aircraft in which there is frequent use of take-off power, particular attention has had to be paid to reliability and overhaul life. The tremendous amount of experience gained on Rolls-Royce Darts and Avons in short-sector operation has, the company explains, enabled new forms of cyclic overload test procedures to be evolved. These are permitting a valuable background of Spey "hot end" life and reliability to be built up.

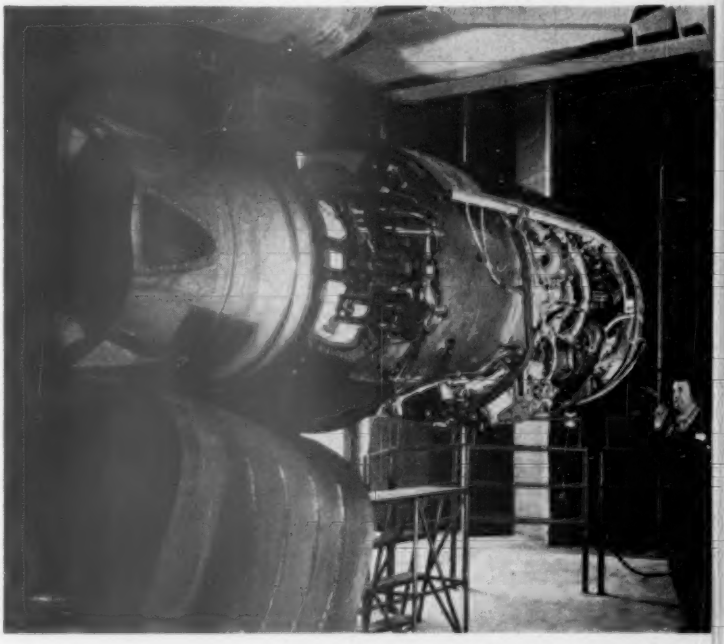
In early August, engines were installed in the prototype Trident airframe and ground running and initial taxi-ing trials were completed at Hatfield. These preliminaries also permitted a check to be made of the airframe systems.

As already mentioned, the Spey became airborne for the first time early last month. On the first day two flights totalling four hours were accomplished and to date a further 13 hours in the air have been completed by the two flight-test engines. Before the Trident goes into service it is planned to complete intensive endurance tests of production-standard powerplants at suitable Trident flight conditions in the Vulcan test-bed.

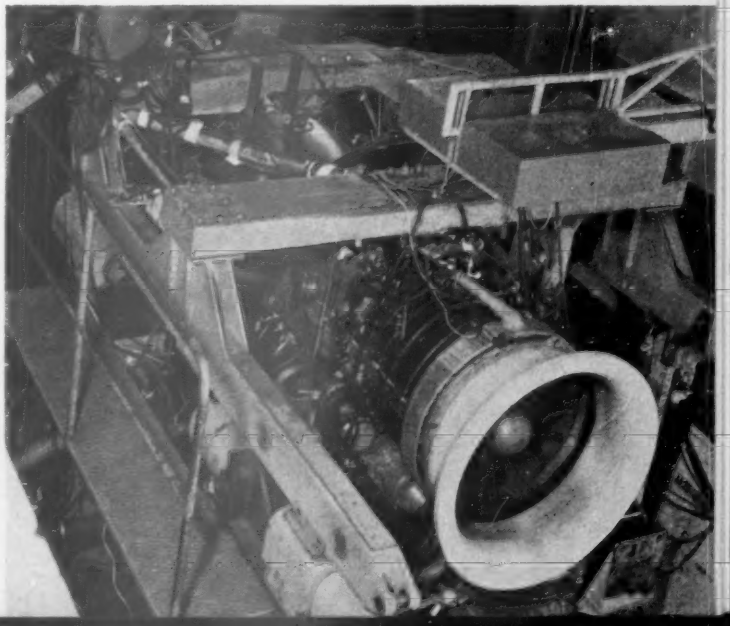
Although the RB.141 military variant of the Spey is fundamentally the same as the RB.163 civil engine, the two are being developed under separate, but allied, programmes. Experience gained with the civil Spey to date is directly applicable to the military engine on which more than 1,500 hours of experimental running have so far been completed.

No details have been released concerning the military RB.141, except a general statement that it requires certain modifications to meet the higher duty conditions of the military rating and to suit the engine for installation in the Blackburn Buccaneer S.2. This version is being developed under Ministry of Aviation contract; its design was initiated in November, 1960, and—according to Rolls-Royce—its Mach number capabilities "can readily be extended for high supersonic applications."

As the first British military by-pass engine to be available in the 10,000-lb.-thrust category, preliminary consideration is being given to application of the Spey to "a number of international military projects." In this context, it is interesting to recall that, at the S.B.A.C. display, Rolls-Royce were showing on their stand a number of hypothetical V/STOL aircraft models and were emphasizing the advantages of using an efficient by-pass engine for forward propulsion when such aircraft make use of the composite powerplant system. For such a purpose, the Spey would appear to be eminently suitable and this with its application to more orthodox forms of aircraft would suggest that it is likely to have a most promising future.



Above, a Spey mounted in a Trident pod for endurance running at Sinfin.



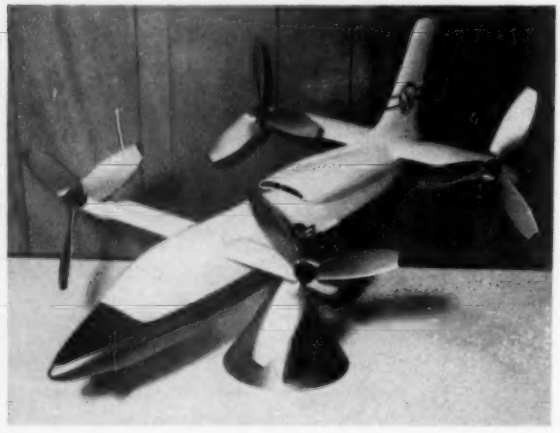
Right, a development Spey on the test-bed having just completed a 150-hour run to the combined A.R.B./F.A.A. type-test schedule.

An Unusual VTOL System

EARLY in 1958 Curtiss-Wright initiated a company-sponsored VTOL aeroplane development programme incorporating a new flight-system principle, utilizing propeller radial force to supplement thrust and wing lift during transition. This system was thoroughly tested during wind-tunnel and full-scale ground and flight tests with the company's Model X-100 test vehicle.

The production configuration, now being developed, is known as the Model 200. It is a high-speed, tandem high-wing aircraft with four tilting propellers mounted in nacelles at the wing-tips. It is of all-metal, semi-monocoque construction with a pressurized cabin, has a fully retractable landing gear, and is equipped for all-weather operation. Powerplants will be either two Lycoming T55 or two General Electric T64 turbines, interconnected by shafts so that either or both engines continuously drive all four propellers.

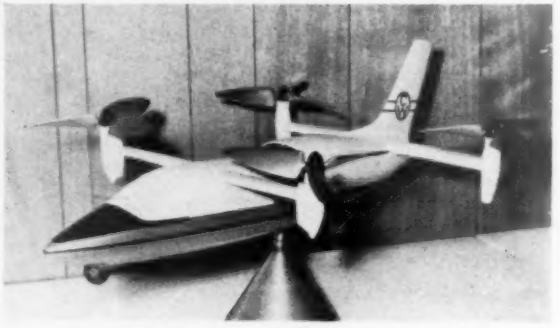
During take-off, hovering and landing, control about the three axes is achieved by use of differential thrust between opposite propellers—pitch by differential blade angles between the two forward and two aft propellers; roll by differential blade angles between two port and two starboard propellers; yaw by differential blade angles between diagonally opposite propellers (the inclination of propeller thrust axis towards the CG and direction of propeller rotation produces horizontal force and thrust components).



In cruise flight, conventional ailerons and elevators in the wings and a rudder in the vertical tail surface provide the control. In transition between hovering and level flight, control is by a combination of differential propeller thrust and the aerodynamic surface controls. As the propellers are tilted forward for transition to cruise, the control by differential thrust is gradually phased out and the aircraft is controlled conventionally. The craft can be flown under complete control at steady state conditions at any forward airspeed from zero to maximum.

Each nacelle and its propeller rotates through an angle of approximately 90°. The craft takes off vertically with all lift supplied by the four propellers in the vertical position; propellers are then rotated forward and the craft accomplishes transition and gains forward speed; and finally the nacelles and propellers assume a horizontal position for flight speeds of 175 kt. and above.

The propellers have been designed by Curtiss-Wright for unlimited life and do not require cyclic-pitch flapping hinges, dampers or drag hinges. They have single-piece, rigidly mounted blades with a standard propeller-blade type of retention, simple single-acting hydraulic dual cylinder and mechanical pitch change. The transmission has simple spur and bevel drives, with the aircraft and propeller loads isolated, and propeller synchro-phasing is incorporated to ensure low noise level. Mechanical upward rotation of the propellers is available for emergency use and permits vertical landings to be made—even in the event of a complete failure of the secondary power system.

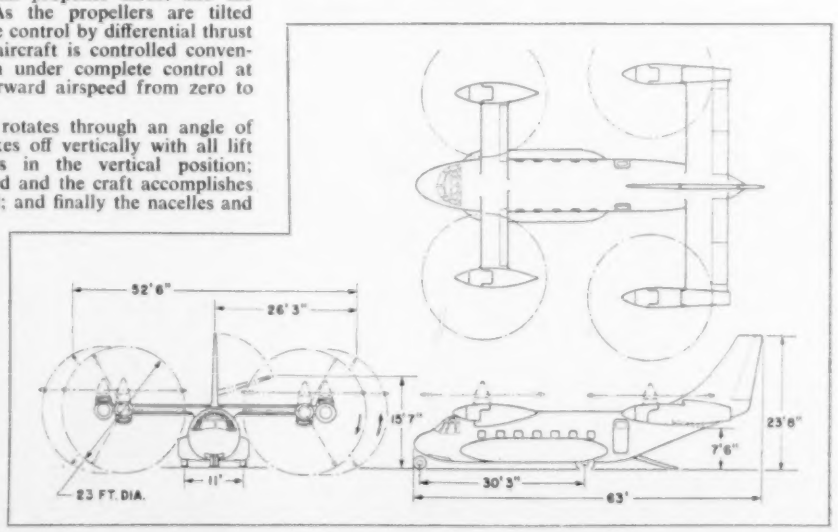


Above, a model of the Curtiss-Wright 200 with propellers in the VTOL position and (left) with them turned horizontally for normal level flight.

To date, some 2,000 hr. of wind-tunnel testing has been accomplished on the Model 200. The design is 95% complete: tools and fixtures are 80% complete; and the first, second and third aircraft are 55%, 35% and 25% complete, respectively.

Gross weight of the Model 200 is given as 12,300 lb. with a normal payload of 800 lb. and a maximum payload of 2,000 lb. Range with the T55 is 735 nautical miles and with the T64, 810 n. miles; with max. payload the range is 425 n. miles. Design cruising speed for best range is 300 kt.; max. speed at 17,500 ft. is 400 kt.; hover ceiling, 9,500 ft.; and rate of climb, 2,730 ft./min.

Possible applications quoted for the Curtiss-Wright VTOL Model 200 are such duties as surveillance, anti-submarine warfare, rescue, liaison, light transport, and low-level attack and support.—HOWARD LEVY.



Right, the Curtiss-Wright LT-1 VTOL Logistic Transport project is basically an enlarged version of the Model 200. It would be pressurized and weigh about 43,000-60,000 lb. gross with a 4-ton payload; its cruising speed would be about 300-350 kt.

Packaged Propulsion

NEW TECHNIQUES in propulsion are constantly engaging the attention of rocket engineers. A recent example is found in the Spartan packaged liquid-propellent engine which de Havilland Engines have developed under a licence agreement with the U.S. Thiokol Chemical Corporation. It was shown for the first time at the S.B.A.C. Show this year (THE AEROPLANE AND ASTRONAUTICS, Sept. 7, 1961, p. 317).

Developed to fill the same basic rôle as the short-duration solid-propellent rocket, the pre-packaged liquid engine offers advantages which are likely to make it more attractive for certain applications. Advantages claimed for the system over an equivalent "solid" are that it is much less sensitive to ambient temperature, and whereas solid units will tend to crack when dropped or otherwise mishandled, a liquid motor of this kind given the same treatment will usually suffer no internal damage. There may also be important benefits in storability.

An admirable survey of the prospects for pre-packaged liquid rocket engines was given before the Royal Aeronautical Society on Oct. 16 by W. F. Neat and K. G. Page of the de Havilland Engine Company. Mr. Neat is the company's chief rocket engineer. The following is a digest of their paper.

The general idea of the packaged liquid motor can be traced back to German work on motors for missiles such as Taifun and the X-4, both of which used nitric acid and an amine fuel as propellents. It is not clear how long before use these motors were charged with propellents and, therefore, to what extent they could really be called packaged. However, they were both anti-aircraft missiles and were required to be at instant readiness. In each of these motors, the propellents were retained in their tanks by burster discs and, in the case of Taifun at least, the tanks were pressurized by a solid charge, thus anticipating present-day thinking.

Work on motors essentialy capable of being pre-packaged has been under way in the United States for the past 10 years or so. Most of it has been done by the Naval Ordnance Test Station at Inyokern, and by the Reaction Motors Division of the Thiokol Corporation. The former's work has included gun-fire and mishandling tests, and long-term storage tests, which are presumably still in progress.

The first firm project undertaken by Reaction Motors was for a motor for the Sparrow air-to-air missile. Preliminary testing was carried out on a work-horse engine—that is to say, one capable of repeated firings, between each of which a thorough examination can be made. The operational Sparrow motor gives 9,000 lb. of thrust, and has now been fully developed.

The second project undertaken was for a motor for the Bullpup air-to-surface missile (Fig. 1). The motor for this application follows the same general design as that for Sparrow but gives a thrust of 12,000 lb.

During the course of this work Reaction Motors were called upon to demonstrate the ability of such motors to be scaled. To do this, a work-horse engine of 50,000 lb. thrust was made and successfully fired.

Reaction Motors are now undertaking a comprehensive programme of product improvement and at the same time, are developing new packaged motors for other missiles. It is also known that elsewhere in the United States contracts have been placed for the development of packaged motors for various applications.

The arrangement adopted for the Sparrow and Bullpup motors is shown schematically in Fig. 2. The two propellent tanks are arranged in tandem. Into the forward (oxidant) tank is recessed a housing containing a solid-propellent grain used for pressurizing the tanks, whilst into the rear (fuel) tank is recessed the combustion chamber. Both propellent tanks are filled towards the end of the manufacturing process, the filling points then being completely welded over or otherwise sealed.

Propellents are prevented from leaking into the pressurizing charge space by burster bands or discs, and into the combustion chamber by a positive sealing injector. The pressurizing charge can be inserted immediately after the propellent tanks are filled or, if more convenient, at a later stage. In either case, it can be removed and inspected whenever considered necessary, without affecting the main propellents.

The initiator to start the charge burning can, for safety considerations, be inserted just prior to firing. This action is in fact the only pre-use preparation which this type of rocket motor needs.

Firing is initiated by an electrical signal to the initiator which ignites a booster charge, which in turn ignites the main pressurizing grain. The pressure generated bursts the rupture devices to pressurize the tanks themselves, and also operate the injector arrangement to admit the propellent into the combustion chamber. The injector is designed not only to seal the tanks prior to firing, but also to ensure that both propellents are injected together, and that one propellent cannot be injected without the other.

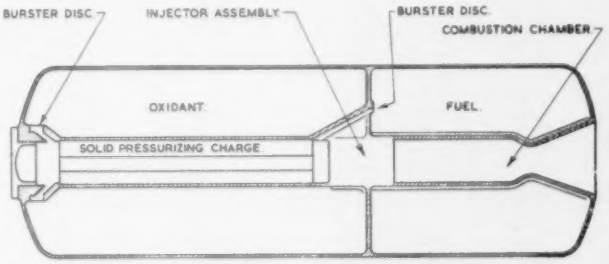


Fig. 2. A typical packaged liquid-propellent rocket engine.

Some of the pressurizing gas can be directed straight into the combustion chamber to promote turbulent mixing of the propellents. This bleed of gas can be so arranged that even if the only moving part in the motor (namely the injector), should seize, enough gas is expelled to prevent an unsafe build-up of tank pressure.

With such an arrangement, full thrust can be obtained in about a tenth of a second. For short burning times amounting to only a few seconds, no elaborate methods are required to get the liquid out of their tanks, and the thrust and total impulse obtained is virtually unaffected by the attitude or acceleration normally encountered in this type of application.

There are a number of obvious variations to this simple theme. For example, while it has been found that a low grade solid grain is a very simple and light means of pressurizing the tanks, there is no reason, if other considerations demand it, why a pressurized gas source should not be used, although this is likely to be heavier and more complicated, especially since a reducing valve would be needed.

Furthermore, Fig. 2 shows an arrangement in which the combustion chamber is recessed into the propellent tanks. This layout suits many applications, providing a clean and conveniently handled package, and, incidentally, it makes it easy for the chamber to be fuel cooled and utilizes all the space around the nozzle for carrying propellents.

As an alternative, the combustion chamber can be attached to the rear of the tanks. By this means the propellents can be stored near the missile's centre of gravity, the combustion chamber can be assembled or removed without disturbing the tanks themselves, and the space around the combustion chamber

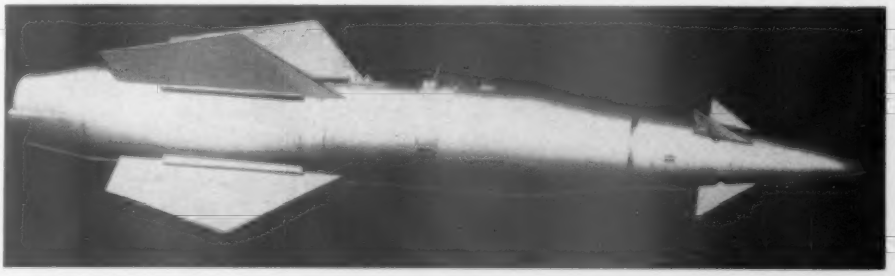


Fig. 1. Latest version of the Martin Bullpup ASM—the GAM-83B—which employs a pre-packaged liquid-propellent rocket engine of 12,000 lb. thrust.

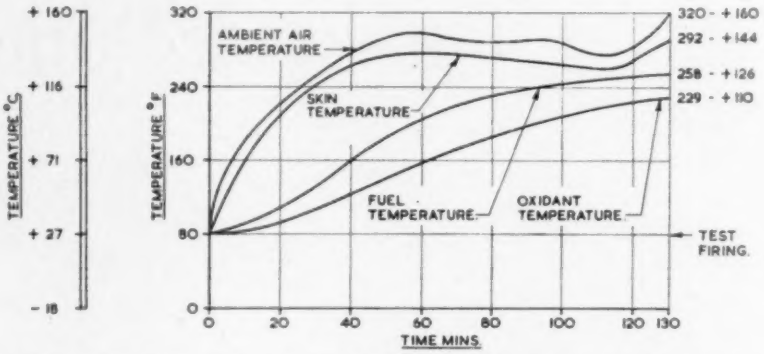


Fig. 3. Graph illustrating the high temperature resistance of a pre-packaged liquid-propellent rocket engine.

can be used for missile components. It is still possible with such an arrangement to liquid cool the combustion chamber, although for very short burning times this may not be necessary, provided the chamber walls are suitably protected (e.g., by a ceramic coating).

Temperature Resistance

One of the most important characteristics claimed for motors of this type is their resistance to environmental conditions. Being completely sealed in their tanks, the propellents can be affected only by temperature, and tests have shown that there are a number of suitable propellents which can be stored without deterioration for periods of years, and then burnt quite satisfactorily after being subject to wide temperature extremes.

In fact it should be possible to operate almost down to the freezing point of the propellents and, bearing in mind that the tanks have to be strong enough for pressurized operation, well beyond their normal boiling points. This means that motors can be stored in a completely unconditioned state, or even out in the open (if necessary already on their launching rails) in widely separated parts of the World.

An incidental advantage of the liquid motor is that it can be carried for long periods at stagnation temperatures greatly in excess of the normal maximum soak temperature permissible. This results from the heat capacity of the liquids themselves, advantage of which can be taken since convection currents allow the heat intake to be distributed through them.

As a result, a build-up of temperature near the outer walls of the tanks is prevented without the need for space and weight consuming insulation. A typical variation of temperatures under such conditions is shown in Fig. 3.

The solid charge is insulated from its surroundings by the propellents themselves and can, therefore, tolerate sudden changes in ambient conditions without the danger of cracking or distorting. In any case, as it is required only for pressurization and not for the direct generation of thrust, the performance of the charge is not critical; therefore one which gives a favourable temperature characteristic can be chosen.

The thrust delivered is a complex function of the burning rate of the solid charge, the viscosity of the propellents through the passages leading to the injector, the pressure drop through the injector itself, and the combustion chamber pressure/flow relationship. It so happens that these functions can be made to a large extent self compensating with temperature, so that the variation of thrust with temperature is small. This factor is especially important to the missile designer, because if the variation is large, as indeed it is with many solid propellent motors, the missile has to be designed strong enough to accept the maximum thrust given at high temperatures, while at the same time, its performance must not be unacceptably degraded at low temperatures.

Since they have to be robust enough to withstand a high internal pressure during firing, packaged motors do not require particularly careful handling. Tests have shown that they can withstand substantial falls without impairing their ability to operate quite satisfactorily and even greater falls without tank rupture and propellent spillage.

This feature is made possible by the fact that there need be no external pipes or valves, the minimum of moving parts, and no rotating parts at all. Furthermore, the pressurizing charge is protected by being recessed inside one or other of the propellent tanks.

No special handling equipment is needed and units can be transported by ordinary means, in inexpensive crates. Instant readiness has already been mentioned as a further feature.

From the present generation of packageable propellents (e.g. nitric acid and a mixed amine fuel), a practical realizable specific impulse of about 245 sec. can be obtained. This is comparable with the order of performance obtained from current solid propellent motors.

However, there are a number of more energetic propellents giving appreciably higher specific impulses. The feasibility of these propellents has already been demonstrated on a small scale and there appears no insuperable reason why they should not be used in packaged motors of a practicable size. Such propellents could be used with higher specific strength materials than those hitherto employed, and one can thus anticipate a potential performance improvement on both counts.

Ideally, the propellents chosen should have a high density, low freezing point, a high boiling point, and should be chemically stable. As one would expect, it is unlikely that there would be any one propellent meeting all these requirements completely. Some compromise is inevitable, the choice obviously depending on the needs of each particular application.

The specification virtually rules out liquid oxygen and hydrogen peroxide as possible oxidants, neither of which are suitable for pre-packing. However, as Table 1 shows, there are still a number of suitable oxidants, especially when it is remembered that because the propellent is contained in a sealed tank capable of withstanding pressure, temperatures well in excess of the normal boiling point can be tolerated.

Table 1 also shows some suitable fuels. Kerosene has not been included, although it would be quite suitable from the storage and performance aspects. However, it is not hypergolic and would require the addition of means for ignition. Hydrazine on its own is not a particularly suitable fuel because of its high freezing point. However, it is included because it has a high density and good performance and can form the basis of mixed fuels, specially tailored for specific applications.

A more suitable propellent combination for a specific application can indeed very often be found by using mixtures of oxidants or fuels. For example, by increasing the nitrogen tetroxide content of nitric acid a higher density can be obtained at the expense of limiting the temperature range. Also by using mixtures of the various amines and hydrazines a more suitable fuel with respect to temperature range, performance, density and viscosity may be obtained.

In addition to its performance potential, the packaged unit can be adapted without much increase in complexity to give a measure of thrust control. It can easily be imagined how, on receipt of a suitable signal, a simple movable injector valve can adjust the flow of propellents into the combustion chamber to vary the thrust, the same valve adjusting a pressurizing gas bleed in order to maintain acceptable tank pressures.

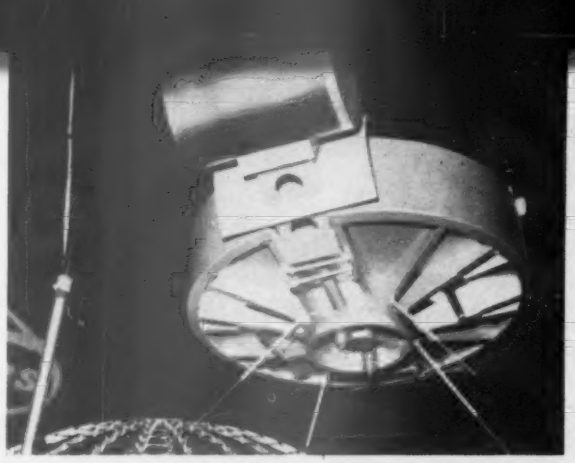
Such an arrangement could be designed to give a discrete thrust change at any time, which need not be predetermined, during the firing of the motor, or it could be developed to give completely variable thrust over fairly wide limits in order to meet the requirements of the missile being propelled. This is the potential capability of the packaged motor, which, coupled with its other attributes, would be extremely difficult to obtain by any other means.

TABLE 1—Physical Properties of Some Storable Propellents

Propellent	Freezing temperature °C	Normal boiling temperature °C	Density at 20°C gm./c.c.
Oxidants			
Inhibited red fuming nitric acid	−54	66	1.57
Chlorine trifluoride	−76	12	1.83
Nitrogen tetroxide	−11	21	1.45
Bromine pentafluoride	−60	40	2.48
Fuel			
Unsymmetrical dimethyl hydrazine	−57	63	0.79
Hydrazine	2	114	1.01
Diethylenetriamine	−65	207	0.96
Monomethyl hydrazine	−52	88	0.88
Pentaborane	−47	60	0.63

New Space Projects

More photographs by Howard Levy from the A.R.S. Space Flight Report to the Nation which was held in New York from Oct. 9-15. A first selection appeared in our issue last week.

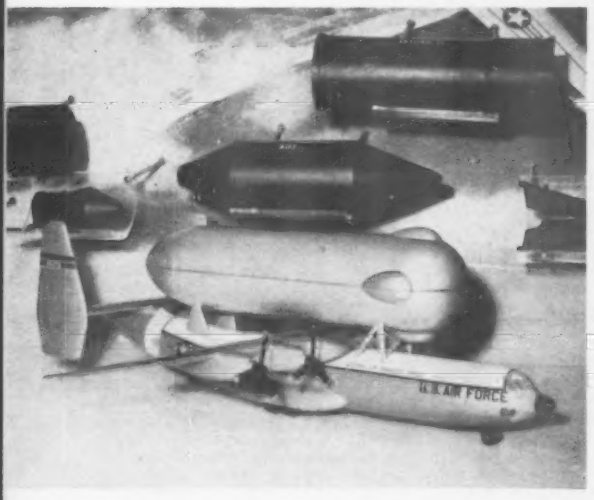


Above, first picture of the SERT I (Space Electric Rocket Test) capsule built by the Radio Corporation of America for the George C. Marshall Space Flight Center. Launched on an hour-long ballistic trajectory by Scout, it will serve to test two experimental ion-engines in a space environment.

Above, a lunar exploration vehicle designed by Space-General Corporation of Glendale, Calif., designed to "walk" on the lunar surface. With six legs and two working-arm "claws", it would be solar-powered and steered from the Earth by tele-control.

Above, NASA concept of a nuclear-powered interplanetary spacecraft designed to carry a crew of seven to explore Mars and return. The round-trip would take 420 days.

Below, an imposing range of space hardware that might be carried by a proposed variant of the Douglas C-133 transport in an outsize external pod. Suggested payloads include Saturn C1, the RIFT nuclear rocket and the Apollo spacecraft.



Latest configuration of the Nimbus meteorological satellite, as displayed in a NASA model. Solar cell panels are shown in the folded position.

Space-booster Test-site

A STATIC test-facility for Saturn and Nova-class vehicles is to be established in south-west Mississippi, NASA announced on Oct. 25. The site is located about 35 miles from NASA's projected Michoud plant in New Orleans where large booster stages will be manufactured for use in the Apollo lunar programme and other advanced space projects. There is deep water access for the transportation of boosters to the Michoud plant via the Pearl River and the Intracoastal Waterway.

It will be possible to build six or more static test stands on the site capable of testing complete booster stages in the 1.5-20 million lb. thrust range. In addition to the 13,500-acre test-site, NASA will require "easement rights" to about 128,000 acres surrounding the test area, covering some 103,000 acres in Pearl River and Hancock counties in Mississippi and 25,000 acres more in Saint Tammany parish in Louisiana. The area is largely flat pine timberland.

Spotting from Space

MIDAS IV launched on Oct. 21 from Point Arguello, Calif., successfully detected the launching of a Titan ICBM as it ascended from Cape Canaveral at the start of a 6,100-mile test firing on Oct. 24. Lift-off was specially timed to coincide with the passage of the satellite circling the Earth in a polar orbit at some 2,100 miles altitude. Midas IV had earlier taken up 350 million hair-like copper dipoles as part of the controversial Project West Ford experiment.

The satellite—actually the Agena-B stage of the launching vehicle—is stabilized in a nose-down attitude so that infra-red heat sensors can pick up the emissions of the missile's exhaust. It is then capable of relaying information to ground stations.

Midas spotted the Titan about 90 seconds after it was launched. "Water vapour and other elements in the atmosphere probably prevented it from locking on the exhaust trail sooner," officials at Cape Canaveral explained. "On the basis of preliminary information we consider it a good test."

The Midas III satellite launched on July 12 was also successful in detecting launchings at Cape Canaveral. It would be interesting to know whether or not Midas has been instrumental in spotting the launching of Russian test missiles, or for that matter Soviet nuclear test explosions. It could, of course, be that such events only take place when Midas is well below the horizon.

MACH CRACKER.—This picture of the canopy of the X-15 research aircraft was taken after a recent flight in which Maj. Bob White flew to an altitude of 40 miles. In coming down, White made a test re-entry manoeuvre "that would have pulled the wings off a conventional plane." The windshield cracked at between 60,000 and 70,000 ft. as he levelled out.

Soviet Space Progress

MORE COMMENTS on Soviet space activities were given in *Red Star* on Oct. 11 in a special section commemorating the fourth anniversary of the launching of Sputnik I. Contributors included Academician M. V. Keldysh, President of the Soviet Academy of Sciences; Major Gherman Titov, the second Soviet astronaut, and Prof. V. Yazdovsky.

Although much of the content of these articles is familiar, there are one or two points of interest. For example, Academician Keldysh confirms that "starting from the first intercontinental rockets built in 1957, the Soviet scientists went on to launch Sputnik I in October of that year."

Listing Soviet achievements since then, he states that the Earth's outer radiation belt was located, that proof was given for the existence of a third outer belt with charged particles and its associated conducting ring, and that it was shown that the Earth possesses a corona of hydrogen atoms. The Soviet scientists, he said, had prepared a map of radiation at a height of 300 km. (190 miles). This showed that the separate areas of increased intensity were associated with the magnetic anomalies of the Earth and with the south Atlantic anomaly in particular.

Information was obtained on the chemical composition of the substances causing cosmic radiation and on the short wave radiation from the Sun. Particle streams were registered and much data obtained on the structure of the atmosphere and the nature of the Earth's magnetic field. The absence of such a field on the Moon was also demonstrated.

Prof. Yazdovsky states that the day is not far off when Soviet astronauts will fly to the Moon and the planets. The Professor divides the medical problems into three main areas. First are those involving low pressure, oxygen lack, and radiation; second are the problems of noise, vibration, acceleration and weightlessness. Noise is a particular difficulty until the main rocket motors are switched off. Vibration has already been thoroughly studied and results show that it is bearable.

So far as accelerations are concerned, results show these are best borne from back to chest or chest to back. Thus the astronaut is best installed in a half lying position. Weightlessness occurs when the main engine of the rocket is switched off and it was thought that the change from acceleration to weightlessness would be easier to bear than the change from weightlessness to deceleration when the retrorockets are operated. This was confirmed in practice.

The third group of problems are those which arise from being in a closed pressure cabin. These are related to feeding, work and rest, isolation, the fact of the removal of Earthly stimuli (i.e., no sense of depth, no outside sounds), the restricted movement, emotional stresses and the clothing which hinders personal hygiene. There is in addition the fact that the natural sequence and rhythm of day and night, work and rest, is altered. Special exercises and tasks must be arranged, for otherwise a man may be reduced to a serious physical and unresponsive state. This also means that the choice of astronauts must be made very carefully.

Gagarin and Titov underwent a full course on the centrifuge, were exercised on vibratory machines, had parachute courses and training on ejection devices and finally went on a full ground training course, practising procedures for their flight in a closed cabin. The astronauts were given experience of weightlessness in aircraft.

All this and the design of the cabin, personal pressure suit and ejection systems are the result of many years of work by Soviet scientists.

In the U.S.S.R. systematic research into the effect of space flight on living organisms began in 1949. From 1949 to 1952 rockets were used to send dogs up in pressure cabins to heights of some 100 km. (62 miles). From 1952 to 1956 researches were directed to the possibilities of flight by animals in pressure suits and non-pressurized cabins. They were ejected at various heights. Then in pressure cabins animals were launched to altitudes of 212 and 450 kilometres (130 miles and 280 miles).

In 1957 valuable data were received from Laika's flight. In 1960 the second space ship, with Strelka and Belka and other organisms, gave important results. Finally, in 1961, a new series of experiments with the animals Chernushka, Zvezdochka and others were made.

These experiments are conducted much more easily on short flights than on long ones, for on the long flights one must arrange a closed circuit for waste products. In order to maintain living conditions in the capsule it is necessary to make up the loss of oxygen and remove the excess carbon dioxide.

But much more capable of development for the future are methods based on photosynthesis, with the use of water plants such as chlorella which can grow very quickly, increasing its mass by several times in the course of 24 hours. Chlorella also contains all the food ingredients necessary for man—carbon, fats, albumen, vitamins, salt, water and so on. Biological methods, however, do require a considerable volume and weight of apparatus.—F.J.F.

Personal Flying

Flying the Bölkow Kl 107C

No. 108 in the Series by John Fricker

AFTER a long spell on the sophisticated products of the American lightplane industry, it was something of a change at Biggin Hill, recently, to go back to the classic European formula of a tail-wheeled aerobatic trainer/tourer. Classic, too, in its all-wooden construction, with ply and fabric covering, although the Bölkow-Klemm Kl 107C conforms to transatlantic standards in being powered by the 150 b.h.p. Lycoming O-320-A2A engine.

This dainty little three-seater marked the end of the prolific output of Dr. Klemm, one of the best-known European light aeroplane designers. The Kl 107C and subsequent developments were taken over by Bölkow-Apparatebau G.m.b.H. at Nabern, which forms part of one of the most versatile groups in the West German aircraft industry, and the three-seat version has been superseded on the production lines by the four-seat Bölkow F. 207.

The Kl 107C is still available to special order, however, and, in basic form, as flown at Biggin, costs £3,950 duty paid, through the U.K. agents, Flair-Aviation Sales, Tower House, College Road, Bromley. In all, 150 of these three-seaters were built, and many are in service with the German flying clubs, as well as for Lufthansa pilot training. The type therefore conforms to the most stringent requirements of the German Government, as well as to normal international airworthiness standards.

Since the basic design was laid down during World War II, the Kl 107 has had a long development background, although the first prototype—a two-seater—did not fly until 1955, when the German industry was permitted to resume operations. Having started with a 90 b.h.p. Continental engine, the prototype was followed by the three-seat production Kl 107A and 150 Lycoming-engined Kl 107B before the introduction of the current version.

Having been the proud owner of a B.A. Swallow, derived from one of Dr. Klemm's earlier designs, I felt almost a proprietary interest in approaching the Kl 107C demonstrator, D-ELOQ. It was a day of near-gale conditions, and as I listened to the cockpit briefing from David Porter of Flair-Aviation, the rain blew frenziedly against the big bubble canopy from what we hoped was a passing storm. The Klemm rocked a little on its rather stalky undercarriage which results from extra long-stroke oleos within the glass-fibre fairings.

The leg action gives rise to some slightly curious reactions on the ground. On starting up the Lycoming with a touch of the flush plastic button on top of the central quadrant, the Klemm subsided gently a few inches (like a Citroen car when stopped) and, when I taxied out on my own, one oleo appeared to stick in the extended position, resulting in a rather undignified but entirely innocuous attitude.

Although tall, the mainwheel legs are balanced by an equally proportioned tailwheel, also glass-fibre faired, so that the ground angle of the Klemm is not far off that of a tricycle type. The view ahead over the flat-topped cowling is good and, with the big transparent canopy, elsewhere it is superb at all times. The usual penalty for this amount of transparency is present in the form of robust engine noise and the big, forward-hinged doors have to be double-locked by safety catches above the windscreen arch.

Door design is changed in the four-seat F. 207, which has upward-hinged types, together with many other modifications. In the Kl 107, for example, the two fuel tanks are mounted, rather unusually, behind the front right-hand seat, forming a flat-topped area on which up to 44 lb. of baggage can be strapped. The third occupant sits alongside the tanks—a fact which prevents the Klemm from being cleared for smoking. In the F. 207, of course, the tanks are in the wings, and this restriction does not apply. Tank capacity in the Kl 107C totals 28.6 imp. gal.—shown on two car-type strip gauges on the centre panel.

With its entirely metric instrumentation and German placarding, the Klemm took me back to the days of the Zaunkoenig—the odd little aeroplane on which I did my first solo cross-country—but British-imported examples would have the necessary Anglicization. D-ELOQ had only very basic instruments, except for the duplication of metric altimeters and a large oil-temperature gauge incorporating a cool-range warning light. This remained on for about the first five minutes of flight, but is apparently not significant.

After a quick demonstration circuit from David Porter, I went off on my own for a brief examination of Klemm handling, moving over to the left-hand seat and buckling up the Continental-type lap-strap and shoulder harness. The rear seat has just a lap-strap, since aerobatics can be done only with two up.

My only initial dislike was the jumble of knobs and levers on the central quadrant, including an up-down throttle lever that I last remember encountering in the sole British-registered Czech Bibi. Since this quadrant has been replaced in the F. 207 by a more sensible arrangement, there is little point in detailing the various controls, except for the fuel-tank selector lever, to the right of the throttle. Either tank can be selected, but Tank 1 should be used for take-off and landing because the adjacent hand-pump on the quadrant functions through it. An unusual feature of both tanks is that their entire contents are said to be usable.

The hand-pump must be used to raise fuel pressure for starting, after which a primer on the left-hand panel can be operated. The wooden fixed-pitch Hoffmann propeller spins over easily with the vertical lever switch set to both mags. Before moving off, the tailwheel is checked unlocked, by raising a small lever between the front seats below the elevator trim wheel. The tailwheel locks for take-off and landing, for better cross-wind capabilities, but otherwise castors.

In the strong winds at Biggin, the pronounced tendency to

Photographs copyright "The Aeroplane and Astronautics"

COMMODIOUS KLEMM.—Cockpit of the Kl 107C is roomy and comfortable, and affords an excellent all-round view. Basic metric instruments are fitted to the German-registered demonstrator.

weathercock suggested that tailwheel steering might be useful, although the toe-operated brakes could be applied quite vigorously without raising the tail.

Before take-off, with flaps up and tailwheel locked, I called Biggin Tower, with excellent reception, on the little Becker 21-channel VHF. This has whistle-stop tuning and works very well except for the slightly complicated selection necessary between transmit, intercom and tune. It is transistorized and costs only £148 in the U.K. This equipment is also handled by Flair-Aviation.

At full throttle, about half right rudder travel is necessary to keep straight, and the Klemm unsticks in a flat attitude at about 80 km./hr. (50 m.p.h.). Climb speed can be varied between 120-130 km./hr. (75-80 m.p.h.) and, at the higher figure, I timed D-ELOQ to 0.3 km. (984 ft.) in almost exactly one minute, and to 0.6 km. in 2 min. 15 sec. Attitude change from climb to cruise is most pronounced, the nose having to be stuffed well below the horizon, Prentice-fashion, to maintain level flight. At 2,450 r.p.m., which represents about 75% power, the Klemm returns just under 200 km./hr. (124 m.p.h.)—so far as I could make out in the very turbulent conditions.

These did not unduly disturb D-ELOQ, which displayed rather more solidity in flight than I expected. The controls require firm rather than heavy pressure, but are extremely responsive. In the case of the ailerons, the effort required is against very positive stick-centring characteristics, stability being, as one would expect, neutral laterally. Elsewhere, it is positive and is allied with well co-ordinated forces, except for the rudder, which is a shade light for my taste.

Overall impression from flying the Klemm is of a slightly heavier Chipmunk, which is quite a satisfying achievement for a touring aeroplane. In the available time and circumstances, I was not able to compare the aerobatic performance, but a fairly prolonged examination of the low-speed handling, including spin entry, revealed other points of comparison with the Chipmunk. In both clean and flapped stalls, the latter with the full 44 degrees of split-flap lowered, there is little or no aerodynamic or artificial warning from the Klemm, which sinks absolutely straight through a gentle breakaway at 70 km./hr. (43.5 m.p.h.) and 50 km./hr. (31 m.p.h.) respectively.

This sort of stall, with full lateral control, results from a gentle approach and a slow reduction of speed as the A.S.I. needle falls towards the bottom of the scale. A more dynamic approach, or *g*-stall, snaps the port wing down fairly smartly during the breakaway and, if you feed in a large amount of rudder in the same direction, the Klemm will start a pre-spin buffet and roll. It would seem difficult to spin off a stall without positive action and the controls remain "live" and responsive at all times. Pro-spin aileron would probably be necessary for a clean entry into autorotation, which is another point of similarity with the Chipmunk.

Never-exceed speed of the Klemm is a high 290 km./hr. (180 m.p.h.) and it is also built to above-average strength factors. At the other end of the scale, I found it possible to approach at 105 km./hr. (65 m.p.h.) for my second landing, despite very gusty conditions, with complete confidence and full control. The degree of elevator power at that speed showed that it would be possible to come down well below that figure with the help of the fairly potent flaps.

I used full flap, although not normally recommended for strong wind conditions, and found that it resulted in a pleasantly steep approach. Lowering flap gave a slight nose-down pitch, and I wound full aft trim to hold the approach speed. A precautionary check showed that overshooting from this configuration resulted in only a moderate nose-up change of trim and, when I motored the Klemm in from finals, I achieved a passable three-pointer with the stick nowhere near its aft limit. With the tailwheel locked, it showed no tendency to swing, but, like all good trainers, it left me with the impression that a nicety of touch was required for really satisfactory operation.

Leading Particulars

Dimensions.—Span, 35.56 ft.; length, 27.23 ft.; height, 7.05 ft.; wing area, 157 sq. ft.

Weights.—Empty, 1,378 lb.; fuel (28.6 Imp. gal.), 203 lb.; occupants (aerobatic weight) 337 lb.; utility gross, 1,918 lb.; three occupants, 514 lb.; baggage, 44 lb.; max. gross, 2,139 lb.

Performance.—Max. speed, 127 knots; cruising speed, 75% power, 111 knots; landing speed, 43 knots; initial climb, 721 ft./min.; take-off distance to 50 ft., 2,509 ft.; landing distance from 50 ft., 1,838 ft.; range, at 105 knots (65% power), 362 n.m.

Gliding Notes

by Dr. A. E. Slater

CANADA'S national height record of 30,630 ft., established by Julien Audette in April this year at Pincher Creek, Alberta, was broken on Oct. 9 at the same place by Edward McClanahan, who climbed beyond the 33,000 ft. which was all his barograph could register. Although Pincher Creek is the site of the Cu-Nim Gliding Club of Calgary, these flights belied its name, for they were made in lee waves.

The Canadian goal-flight record is 335 miles, set up this year by Charles Yeates, who represented Canada in the 1958 World Championships in Poland, where he finished 18th out of 37 in the Open Class. Yeates flew his record from Brantford, Ontario, to Marion, Indiana, in a Schweizer 1-23H.

Starting at 10.40, nearly an hour after the first cumulus appeared, he took 8 hours and could have carried on longer, as he reached his goal at 4,000 ft. Early in the flight he saw a DC-7B climbing at full power after taking off from Willow Run, and noticed that he was climbing at exactly the same rate in a thermal, without any mechanical assistance.

* * *

WHEN I heard from John Sproule that Air Commodore H. Probyn, whose motorized Grunau was described in THE AEROPLANE AND ASTRONAUTICS for Jan. 6 on the same page as Gliding Notes, had been using the machine in Kenya both for soaring and for going places with the engine, it seemed that a genuine dual-purpose machine was in operation at last; so I wrote to find out.

Air Cdre. Probyn has kindly sent some particulars which show the answer to this question to be that he often uses both methods simultaneously. He has long been mixed up with gliding—there is mention of "Sq. Ldr. Probyn" in *The Sailplane and Glider* for June 26, 1931.

The Grunau Baby was built some years ago at Nyeri, Kenya, with the help of a Kikuyu carpenter and labourer. The trouble of getting a car-towed launch, often with the added frustration of a reversal of wind direction at 500 ft., induced Air Cdre. Probyn to fit a Volkswagen engine, as modified for the French ultra-light Turbulent, on top of the wing. As it is not retractable, the gliding angle is not what it was, but nevertheless the thermals are "many, frequent and strong" and he often soars the machine with the engine throttled right back—if stopped altogether it cannot be started again.

Though the engine was installed to make it a "self-launching sailplane," it soon moved into the dual-purpose category, for its owner uses it also for "viewing game" and for making occasional visits, e.g. 700 miles to the coast and back. But with only 26 h.p., and the local aerodromes being at 6,000-8,000 ft. a.s.l., he has to use thermals "to counteract the downdraughts." Anyone without soaring experience (i.e., the sort of people who would buy such a machine if it were to be put on the market) would immediately complain that it was "under-powered," and bring out the usual stuff about no light aeroplane being "practical" unless it has at least *x* horse-power (*x* used to be 60 when the Moth came out 37 years ago, but is now well over 100).

Air Cdre. Probyn has now done 130 hr. in the engined machine—soaring, power-flying at just under 2 gal./hr., and both together at a typical consumption of just over 5 gal. in 4 hr. But one can hardly expect him to answer the question: what proportion of flying time he spends in pure soaring, for this would involve keeping a log on a knee-pad and continual references to his watch, and he flies his motorized Grunau for enjoyment.

* * *

KANSAS SOARING ASSOCIATION, which organized this year's U.S. Championships, expects to add seven sailplanes to its privately owned fleet by next spring. Similar news in this country would prompt the question: "Who is buying what from whom?" But the Kansas seven are all being built at home.

Bob Leonard and Harold Kennedy are each making a Cherokee and Bernard Mohr a BG-12, both being wooden types; and Bob Nichols is building a machine of his own design out of metal. Of the famous Schweizer all-metal kits, Dean Shelor has bought one for a 1-26A from another pilot, and Dave Blanton and Jim LeSueur have each ordered a kit for the new 2-32 two-seater.

This new Schweizer machine, the 2-32, is designed "to provide a sailplane for general family use," an advanced trainer for soaring instruction, with a performance suitable for competition and record attempts. Its laminar-flow wings will be mainly metal-surfaced, with fabric on the ailerons and possibly on part of the wing. The monocoque fuselage will be of metal, and the rear pilot's seat will be slightly higher than the front one, with a single Plexiglass canopy covering both.

Minimum sink is given in the polar diagram as just over 2 ft./sec. at about 47 m.p.h., and two alternative gliding ratios of 32.5 and 35.2 at about 56 m.p.h.

In kit form the sections will be rather more complete than those of the single-seater 1-26, and the price will consequently be about 40% more, Howard Levy writes.

Correspondence

Those Good Old Days

MR. F. E. CHASEMORE'S letter (THE AEROPLANE AND ASTRONAUTICS, Oct. 19) about the Good Old Days brings back nostalgic memories of the late 1930s when flying was almost unrestricted. The following incidents were observed over Birmingham during this period:—

The gentle wing-tip touch of two Westland Wapitis of 605 County of Warwick Squadron which broke up a lovely tight formation of five aircraft (I wonder whether a certain pilot named Lloyd remembers this incident?). The vertical dive out of a 10/10th cloud base in a tropical downpour of an Armstrong Whitworth Siskin IIIA, which nearly went through the roof of a house. The Moth Major which got into the backwash of a Boulton Paul Overstrand—resulting in a wonderful display of unpremeditated aerobatics! The Avro 504 advertisement tug which got entangled with a flight of five Overstrands.

Over Billesley Common which once boasted of a flying school (see THE AEROPLANE, Nov. 29, 1916, p. 1074). I noted these additional near misses: During a violent thunderstorm, lightning lit up a Westland Lysander which missed a de Havilland Moth Minor monoplane by a few feet—that was a near one. Another head-on near miss was between a Bristol Blenheim I and a D.H. Rapide, in this case the Blenheim pilot had the sun right in his eyes.

I recall the unexpected appearance of a Fokker F.22 airliner during the pre-Hitler War flap; and, during the War, an Airspeed Oxford which dropped out of a large cloud straight on top of another one. They were so close that, for a moment, they looked like a twin fuselage biplane! Perhaps one of these pilots who is still addicted to THE AEROPLANE (as I am) will remember one of the incidents in question and air his own views on the subject.

In every instance except two (the Moth Major from Castle Bromwich and the Oxfords) all the aircraft were flying under 3,000 ft.

Birmingham, 14. M. AUSTIN.
(Ex R.O.C.)

Let's Keep It Steady

HOW right Mr. Chasemore is (correspondence, Oct. 19) in his observations concerning the lack of aerial manœuvres to be seen in the skies these days—particularly around London and other centres of population. Perhaps, however, he should take comfort from this paucity and not feel the loss too badly.

At Egham, of course, he is within the general L.A.P. "zone of influence," and should the staid progress of such splendid aeroplanes as the Viscount and Vanguard, Comet and Caravelle, 707 and DC-8 be enlivened with falling leaves, spins, rolls and loops, one feels that the situation would be rather more a case for alarm than for pleasure.

London, W.1. F. THOMAS.

"—By Any Other Name"

THE B.A.C. One-Eleven is intended as a replacement of the Viscount. So why not name it the Jet-Viscount? And the D.H. 125 is a jet successor to the Dove so it would be better called the Jet-Dove rather than Jet-Dragon. I am told the name Jet-Dragon has been dropped officially.

Both Viscount and Dove have magnificent reputations in service, so surely it would only be common sense to cash in on such famous names.

London, W.14. GEOFFREY DORMAN.

H. R. Vaughan-Fowler

SADLY I read of the death of Vaughan-Fowler and would like to record a generally unknown facet of his life in India.

Some of us possess quite unusual qualifications, e.g., I am personally very proud of having passed a Farriers Course and of once playing the organ in Westminster Abbey. But V-F had the extraordinary ability of being understood throughout India—where (so I am told) there are 400 million people, and over 300 languages . . . Hindu, Pushtu, Urdu, etc.—for India is obviously a very U-place, as V-F was a very U-person, complete with Oxford accent and an eyeglass. This piece of Branckerian equipment was all part of the act which enabled him to master the language problem.

He once confided in me how he worked the trick. First, he always—but ALWAYS—wore the monocle, even under a showerbath, even when asleep. Imagine then, the scene which was commonly repeated through the Brown Continent. It is the hour before Sunrise, in Sweatipore, and already hot. Prone on the bed, naked but for a towel round his middle, lies Fowler Sahib, with, overhead, a gently turning punkah. Barefoot, silent as a thief, across the stone floor comes a bearer, bearing a cuppa cha. This is placed gingerly beside the sleeping sahib, from whom, quite unexpectedly, comes a growl in Hindu, Pushtu, Urdu or whatever is current in Sweatipore; it resolves into meaning to the native: "You are making too much bloody noise!"

Stung by the sheer injustice of this remark, the bearer at once breaks into a torrent of Hindu, et cetera, to explain that with bare feet on a stone floor he could not have made a noise. V-F would allow the spate of protestation to run its course, and then, like an expert angler, would come out with a new jag on the hook: "Furthermore, this tea is cold!"

Astounded by this rank untruth, again the bearer would protest profusely in Hindu, et cetera, and again Fowler Sahib would bide his time before producing the *coup de grace*: "Do not argue with *me*!"

Defeated by such an impossible sahib, the bearer would then submissively talk in such English as he could muster, for he would then not be misunderstood. And thus did V-F master the 300 languages of India. Salaam Sahib Fowler: Thy Shadow Grows No Less.

London, S.W.7. B. J. HURREN.

Groundabout

Our Men in the Ministry. So Air Vice-Marshal "Gus" Walker has survived his two-year tour as the R.A.F.'s Chief Information Officer (the first serving officer to hold the post) and, unscathed, has now taken over Flying Training Command. With him go the regards of the Press. Before moving to Shinfield Park, the A.V.M. took a refresher flying course and renewed his instrument rating with great success at the R.A.F. Flying College, Manby; pretty wonderful for a 49-year-old man with one arm. He lost his right arm trying to get somebody out of a crash, I believe, but like other afflicted and stout-hearted Britons, remained undaunted, designing an artificial right arm for flying, but playing golf one-armed off an 18 handicap. He hands over a friendly Press to the new C.I.O., Air Cdre. John Barraclough, an Old Sunderlandonian, which alone assures him of a warm welcome from us roving Pressmen, flying-boatmen all—at heart, anyway.

*

"Miss Olsen, when I dictated this newsletter to you, I spoke of Head Office as 'the Nerve Centre'—what the devil d'you mean by printing it as 'the *Nervous* Centre'? Wait a minute, though—come to think of it. . . ."

*

The Rain on the Plane. . . . The legend about Manchester and its rain is well-founded. The latest evidence comes from B.O.A.C. who issue passengers with large umbrellas for dry travel between aircraft and terminal there. Also, if you slip on the wet steps the umbrella provides a certain amount of parachute-effect on the way down, as I found when leaving a Japan Air Lines DC-4 at Osaka Airport. They have Manchester-type rain there, too.

Larry

Industry Record

Landing and Navaid Test Set

A VOR/ILS signal simulator giving a 1° change in VOR bearing in accordance with current A.R.B. recommendations has been introduced by Communications (Air), Ltd., one of the Cossor Group of companies.

Apart from having this facility the new equipment, known as field test set type FT 13C, is similar to its predecessor, the FT 13B, itself an "automated" equipment which enables a single semi-skilled technican to check the VOR/ILS installation of an aircraft in situ in about 10 minutes. This additional facility is available on manual control only.

The new test set is not intended to replace the FT 13B which is still available to users who find the 60° change in VOR bearing provided by this version adequate for their own particular requirements. Also the FT 13B equipment can be modified to conform to the new specification.

The Foamite adaptation of the Land-Rover for use as a crash rescue vehicle.

Suppressing Noise

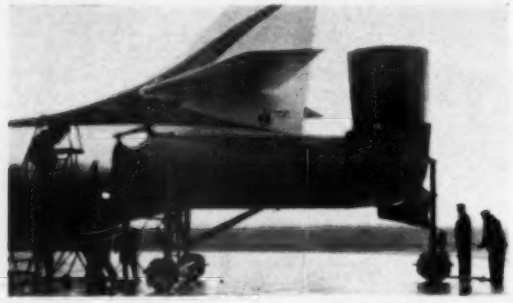
Ground jet engine silencers designed by Bertin et Cie of Paris are now being manufactured by Frederick Braby and Co., Ltd., parent company of the Braby of Britain Group, and an order has already been forthcoming from the M.o.A. on behalf of the R.A.F. Sales and service of the silencers are to be handled by the aircraft equipment division of Auto Diesels, Ltd., a Braby company, in Commonwealth countries and Eire as well as the U.K.

The Bertin silencer is a lightweight unit which, by virtue of its complete mobility, can be used on airport aprons for engine run-up tests—doing away with the need to move the aircraft to a static silencer in the maintenance area. The effect achieved during tests is to reduce noise by 27-30 db., the attenuation being even throughout the waveband.

An overall noise level of about 95 db. at 100 yd. or so from the aircraft when running at full power results. This is said to be at a comparable level to the noise experienced at an underground station when a train enters.

Two working prototypes of the Bertin silencer have been in use for some months with Air France Caravelles at Orly Airport. Designs for a unit specially tailored for the Boeing 707 and Douglas DC-8 are now well advanced. This, it is claimed, will have a higher silencing performance than those at present in use at Orly and will give a minimum of 30 db. attenuation.

The design of the silencer as a whole can be varied to suit particular engine installations and can be readily adapted to engines of any power yet envisaged.



The Bertin silencer is moved into position for use with a Caravelle.

Safety Services Equipment

A new light crash rescue truck for the R.A.F. is now in production by Foamite, Ltd., following the completion of operational and rough driving tests.

Based on the chassis of the well-tried Land-Rover (in its long-wheelbase form) it has the usual metal cab and observation hatch. Mounted behind the cab are two 200-lb. dry chemical powder appliances, each having 60 ft. of Plastidry hose and discharge guns with turret heads carrying flat fan and cone discharging nozzles. Powder discharge at the rate of 6 lb. per sec. from each appliance is by nitrogen under pressure.

Standard crash rescue equipment is carried including a pneumatic saw. R/T is also standard. Specialist lighting by Harley Aircraft Landing Lamps, Ltd., comprises a long-range searchlight and extendible site light for all-round illumination during night rescue operations.

Fully loaded and with a two-man crew, the vehicle can traverse rough terrain and is capable of 60 m.p.h. A two-wheeled trailer of up to one ton gross can be towed.

Foamite is also producing for the R.A.F. a new carbon dioxide fire extinguisher trailer for use at servicing and dispersal areas.

Enlarging Production Space

Extensions costing in the region of £350,000 have recently been completed by Murex Welding Processes, Ltd., of Waltham Cross. Two new buildings have been erected. One is a 500-ft. long single-storey production shop with an uninterrupted floor area of 62,000 sq. ft. for the manufacture of electric arc welding plant. The other is a two-storey office block of 7,200 sq. ft. to accommodate the plant sales, drawing and works engineer's offices.

Aviation Calendar

Nov. 3

London. — R.Ae.S. Rotorcraft Section lecture, "Electronic Flight Information Displays for Rotary-wing Aircraft," by Wg. Cdr. J. C. G. Bell, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 4

Prestwick Airport. — R.Ae.S. Glasgow Branch lectures, "Airframe Production," by J. Woods and "Engine Production," by F. T. Salt, and tour of works, at Scottish Aviation, Ltd., from 10.30 hrs.

Nov. 8

London Airport.—R.Ae.S. lecture, "The Scientific Investigation of Aircraft Accidents," by P. B. Walker, in the Senior Mess, B.O.A.C. Headquarters, at 18.00 hrs.

Nov. 9

London. — Radar and Electronics Association lecture, "Space Communications — Orbits and Economics," by W. F. Hilton, at the Royal Society of Arts, John Adam Street, W.1, at 19.00 hrs.

Nov. 10

London. — British Interplanetary Society lecture, "Photography from Rockets and Satellites," by R. Hall, at the R.Ae.S., 4 Hamilton Place, W.1, at 18.30 hrs.

Nov. 14

London.—R.Ae.S. Astronautics and Guided Flight Section lecture, "A Comparison of the Control Problems of Missiles and Manned Aircraft," by K. W. Smith, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 15

London.—Kronfeld Club Annual Exhibition of Aviation Paintings and Drawings, in the Basement, 74 Eccleston Square, S.W.1; until Nov. 25.

Prestwick Airport. — R.Ae.S. Glasgow Branch Graduates' and Students' Section lecture, "Developments Intended for Prestwick Airport," by C. D. Waldron, at 19.30 hrs.

Company Notices

NEW COMPANIES

Engineering Designs (Ipswich), Ltd. (705,102).—Private co. Reg. Oct. 6. Cap. £100 in £1 shs. To carry on the business of general constructional, aircraft and mechanical engineers, precision engineers, brass and iron founders, aircraft and general design and consultant engineers and draughtsmen. Directors: Maurice P. Sayer (permanent), Lark Rise, Alresford Road, Wivenhoe, Essex. Denis H. R. Sayer, Railway House, Bentley, Suffolk. Sec.: M. P. Sayer. Reg. off.: 34 Lower Brook Street, Ipswich, Suffolk.

Mexfield Aviation (Sales), Ltd. (705,523).—Private co. Reg. Oct. 12. Cap. £2,000 in £1 shs. To carry on the business of dealers in motor cars, aeroplanes. Directors: Peter L. Dewey, 55 Blantyre Street, S.W.10. Charles E. Slade, 36 Ellerker Gardens, Richmond, Surrey. Sec.: M. Digby-Smith. Reg. off.: 60-66 Wardour Street, W.1.

INCREASES OF CAPITAL

Air Condor, Ltd. (649,566), Howland House, Howland Street, W.1.—Increased on Aug. 25, 1960, in £1 non redeemable preference shares, beyond the reg. cap. of £10,000. (Reg. May 10, 1961).

Cunard Eagle Airways (Holdings), Ltd. (561,051), 12 Low Pavement, Nottingham.—Increased on April 13, 1961, by £1,000,000 in £1 ordinary shs., beyond the reg. cap. of £1,000,000.

Cunard Eagle Airways, Ltd. (521,316), 32-50 Edgware Road, W.2.—Increased on April 13, 1961, by £990,000 in £1 ordinary shs., beyond the reg. cap. of £10,000.

Executive Air Transport, Ltd. (670,302), 42-46 Hagley Road, Birmingham, 16.—Increased on April 24, 1961, by £194,000 in 5s. ordinary shs., beyond the reg. cap. of £6,000.

New Patents

APPLICATIONS ACCEPTED

883,633.—**Rolls-Royce, Ltd.**—"Jet pipe nozzle." July 9, 1959. (July 18, 1958.)

883,865.—**Power Jets (Research and Development), Ltd.**—"Aerofoil boundary layer control systems." Sept. 16, 1959. (Sept. 17, 1958.) (Cognate application 20585, June 16, 1959.)

883,819.—**Bristol Siddeley Engines, Ltd.**—"Supporting of a jet propulsion engine from a helicopter suspension rotor blade." Mar. 25, 1960. (Mar. 31, 1959.)

883,869.—**United Aircraft Corporation.**—"Power transmission system for a helicopter." May 5, 1959. (Aug. 28, 1958.)

883,634.—**Rolls-Royce, Ltd.**—"Gas-turbine engine." July 31, 1959. (Aug. 15, 1958.)

Printed specifications of the above will be available on Dec. 6, 1961, and the opposition period will expire on Mar. 6, 1962.

Personal Notices

BIRTHS

Garstin.—On Sept. 29, at R.A.F. Hospital, Wegberg, to Ann (*née* Lumsden), wife of Sqn. Ldr. L. K. Garstin—a son.

Hobson.—On Oct. 14, at Edinburgh, to Barbara (*née* Hammond), wife of Wg. Cdr. M. E. Hobson—a son.

Whitelam.—On Oct. 17, to Anne (*née* Seabrook), wife of Flt. Lt. G. E. Whitelam—a daughter.

DEATHS

Burgess.—On Oct. 17, at the R.A.F. Hospital, Uxbridge, Flt. Lt. J. W. Burgess.

Nobbs.—On Oct. 2, Air Cdre. C. J. Nobbs, C.B.E., R.A.F. (retd.).

Desoutter have recently acquired a new factory at Angmering-on-Sea, Sussex, to increase their production capacity.

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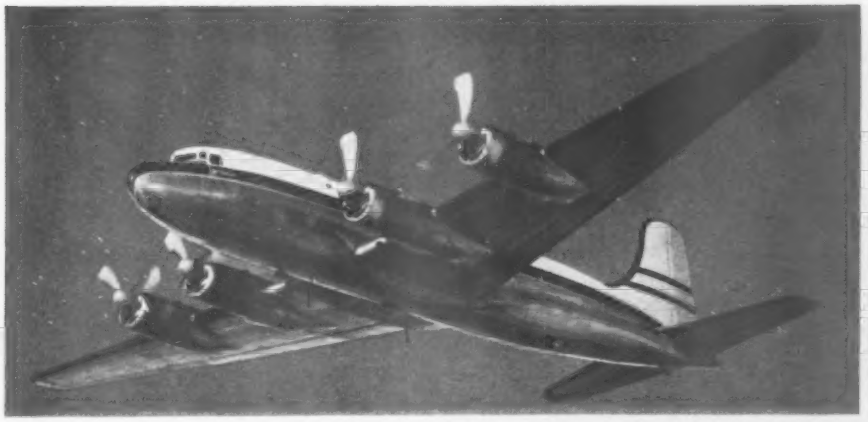

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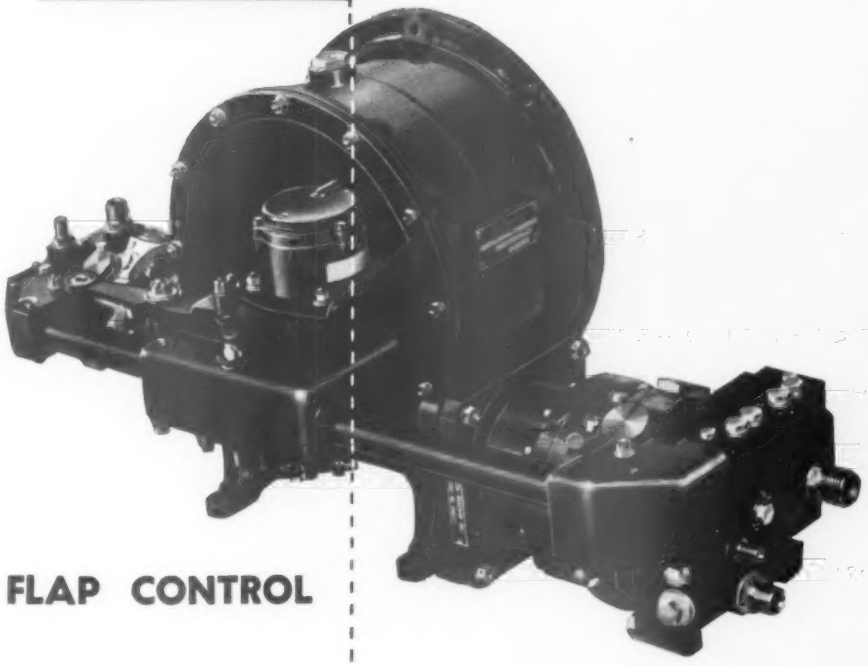

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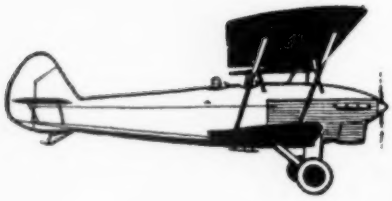

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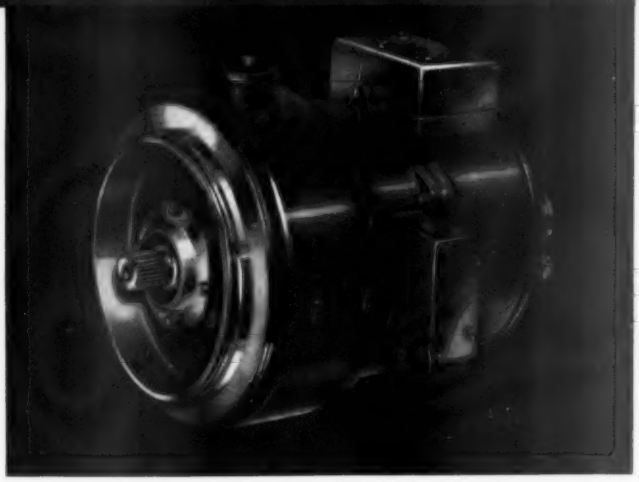

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